Six County Association of Governments

Comprising:

JUAB, MILLARD, PIUTE, SANPETE, SEVIER, AND WAYNE COUNTIES

Pre-Disaster Mitigation (PDM) Plan

Prepared By:

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SIX COUNTY PLANNING STAFF

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Administrative Assistant…………………………………………………Mindy Winegar

TABLE OF CONTENTS

Executive Summary

Plan Mission
The mission of the Six County Association of Governments (SCAOG) Pre-Disaster Mitigation Plan is to substantially and permanently reduce, communities within the SCAOG, vulnerability to natural hazards. The plan is intended to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the natural environment. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the community towards the development of a safer more sustainable community.

Plan Organization
The Six County Association of Governments plan was developed and organized within the rules and regulations established under 44 CRF 201.6. The plan contains a discussion on the purpose and methodology used to develop the plan, a profile on communities within SCAOG, as well as a hazard identification study and a vulnerability analysis of eight hazards. To assist in the explanation of the above-identified contents there are several appendices included which provide more detail on specific subjects. This is intended to improve the ability of communities within the SCAOG planning district to handle disasters and will document valuable local knowledge on the most efficient and effective ways to reduce loss.

Plan Financing
The SCAOG Pre-Disaster Mitigation Plan has been financed and developed under the Pre-Disaster Mitigation Program provided by the Federal Emergency Management Agency (FEMA) and the Department of Public Safety Division of Emergency Services and Homeland Security. The SCAOG aided in funding, providing in-kind assistance to local governments.

Plan Participation
The SCAOG Pre-Disaster Mitigation Plan has been completed as a result of a collaborative effort between Six County Association of Governments, Department of Public Safety Division of Emergency Services and Homeland Security, public agencies, and the citizens, elected officials, and public employees of the cities and towns within Juab, Millard, Piute, Sanpete, Sevier, and Wayne Counties. Interviews were conducted with stakeholders from the communities, and a workshop was conducted during the plan developments. Additionally, through public hearings, workshops, and draft plan displays; ample opportunity was provided for public participation. Any comments, questions, and discussions resulting from these activities were given strong consideration in the development of this plan. Completion of this multi-jurisdiction mitigation plan was completed with assistance and input from:

Juab County

- Emergency Manager; Roads Department; GIS Department, Eureka City, Town of Levan, Mona City, Nephi City, and Rocky Ridge.

Millard County

- Emergency Manager, Roads Department, Sheriff's Department, Delta City, Fillmore City, Town of Hinckley, Town of Holden, Town of Kanosh, Town of Leamington, Town of Lynndyl, Town of Meadow, Town of Oak City, and Town of Scipio.

Piute County

- Emergency Manager, Roads Department, Sheriff's Department, Town of Circleville, Town of Junction, Town of Kingston, and Town of Marysvale.

Sanpete County

- Emergency Manager, Town of Centerfield, Ephraim City, Fairview City, Town of Fayette, Fountain Green City, Gunnison City, Manti City, Town of Mayfield, Moroni City, Mt. Pleasant City, Spring City, Town of Sterling, and Town of Wales.

Sevier County

- Emergency Manager, Town of Annabella, Aurora City, Town of Elsinore, Town of Glenwood, Town of Joseph, Town of Koosharem, Monroe City, Town of Redmond, Richfield City, Salina City, and Town of Sigurd.

Wayne County

- Emergency Manager, Town of Bicknell, Town of Hanksville, Town of Loa, Town of Lyman, and Town of Torrey.

Hazards Identified

It was suggested by the Division of Emergency Services and Homeland Security, at a minimum, Six County Association of Governments address the hazards of: earthquake, flood, landslide, problem soils, wildfire, dam failure, severe weather, and drought. However, there are other hazards that were identified which are not in the minimum criteria established by DESHS that were added to the discussion.

The hazard identification study recognized the following hazards as being the most prevalent and posing the most potential risk to the counties and towns within the SCAOG planning district.

- Earthquake, Flood, Drought, Landslide, Wildfire, Problem Soil, Dam Failure, and Severe Weather.

Plan Goals

In an effort to ensure that the mission of the Six County Association of Governments Pre-Disaster Mitigation Plan is met, the participants in the development of this plan defined and established a list of goals, which are directly relevant to meeting the mission of the plan.

The following is a list of the goals identified by the participants of this plan:

- Protection of life before, during, and after the occurrence of a disaster.
- Preventing loss of life and reducing the impact of damage where problems cannot be eliminated.

- Protection of emergency response capabilities (critical infrastructure)
- Communication and warning systems
- Emergency medical services and medical facilities
- Mobile resources
- Critical facilities
- Government continuity
- Protection of developed property, homes and businesses, industry, education opportunities and the cultural fabric of a community, by combining hazard loss reduction with the community's environmental, social and economic needs.
- Protection of natural resources and the environment, when considering mitigation measures.
- Promoting public awareness through education of community hazards and mitigation measures.
- Preserving and/or restoring natural features that provide mitigation such as floodplains.
- Minimize the impacts of flooding
- Minimize the impacts of drought
- Minimize the impacts of severe weather
- Minimize the risk of wildfire

Part I. Pre-requisite Adoption by the local jurisdiction

The Six County Executive Board, as well as the counties and communities participated in and promulgated this plan. The Six County Association of Government PDM plan was developed as a multi-jurisdictional plan; therefore, to meet the requirements of Section 322 of the local hazard planning regulations the final plan was to be adopted by each of the municipalities as well as the six counties. This section documents each jurisdiction participated in the process and adopted the plan. The plan was adopted prior to being submitted to FEMA region VIII for final review. Table 1 identifies the communities that participated in the planning process and have adopted the plan. Promulgation letter copies have been included in *Appendix K* of this plan. Once the plan is approved *Appendix K* will also include a copy of the letter of transmittal, the community resolutions, etc.

Table 1: Community Participation

Counties/Jurisdictions	**Participated (Yes/ No)**	**Date**
Juab County		
Eureka City		
Town of Levan		
Mona City		
Nephi City		
Town of Rocky Ridge		
Millard County		
Delta City		
Fillmore City		
Town of Hinckley		
Town of Holden		
Town of Kanosh		
Town of Leamington		
Town of Lynndyl		
Town of Meadow		
Town of Oak City		
Town of Scipio		
Piute County		
Town of Circleville		
Town of Junction		
Town of Kingston		
Town of Marysvale		
Sanpete County		
Town of Centerfield		
Ephraim City		
Fairview City		
Town of Fayette		
Fountain Green City		
Gunnison City		
Manti City		
Town of Mayfield		
Moroni City		
Mt. Pleasant City		
Spring City		
Town of Sterling		
Town of Wales		
Sevier County		

Counties/Jurisdictions	**Participated (Yes/ No)**	**Date**
Town of Annabella		
Aurora City		
Town of Elsinore		
Town of Glenwood		
Town of Joseph		
Town of Koosharem		
Monroe City		
Town of Redmond		
Richfield City		
Salina City		
Town of Sigurd		
Wayne County		
Town of Bicknell		
Town of Hanksville		
Town of Loa		
Town of Lyman		
Town of Torrey		

Acknowledgements

Six County Association of Governments would like to extend their appreciation to the following agencies, which assisted in the development of this plan.

- Division of Emergency Services and Homeland Security
- Utah Geologic Survey
- Automated Geographic Reference Center
- United States Army Corps of Engineers
- Division of Water Rights Dam Safety Section
- Federal Emergency Management Agency Region VIII
- National Weather Service
- Utah Division of Forestry, Fire, and State Lands
- Councils of Governments (Tribal and local)
- Juab County Emergency Management
- Millard County Emergency Management
- Piute County Emergency Management
- Sanpete County Emergency Management
- Sevier County Emergency Management
- Wayne County Emergency Management
- Six County Mayors and Commissioners
- Six County Emergency Managers and city personnel
- Salt Lake City Emergency Management
- Utah Division of Water Resources
- Wasatch Front Regional Council
- Mountainland Association of Governments
- Southeast Utah Association of Local Governments
- Uintah Basin Association of Governments
- Bear River Association of Governments
- Five County Association of Governments
- Paiute Indian Tribe of Utah (PITU)
- PITU Emergency Management
- Kanosh Band, PITU
- Koosharem Band, PITU

In addition we offer a sincere thanks to Clackamas County, Dunn County, Salt Lake City, Kidder County, Jefferson County, and Hyde County for allowing review of their mitigation plans.

Preface

The Six County Association of Governments (SCAOG) in 1970 received official designation as a planning district. Its geographic service delivery area of Central Utah comprises Juab, Millard, Piute, Sanpete, Sevier, and Wayne counties. This organization is required to establish and implement all future planning endeavors to benefit its citizenry. Due to economies of scale this regional methodology is a pragmatic and effective utilization of limited resources.

In accordance to the Six County Executive Board's governance all pertinent (natural hazard mitigation) planning groups were contacted by the SCAOG planning staff. These groups included elected officials and special interest representation for units of local government, i.e., emergency managers, law enforcement officers, etc. Their input was essential in the development of the SCAOG Pre-Disaster Mitigation Plan and recommended for adoption by the Six County Association of Governments.

Introduction

The State of Utah is vulnerable to natural, technological, and man-made hazards that have the possibility of causing serious threat to the health, welfare, and security of our citizens. The cost of response to and recovery from potential disasters can be lessened when attention is turned to mitigating their impacts and effects before they occur or re-occur.

What is Hazard Mitigation? Hazard mitigation is defined as any cost-effective action(s) that have the effect of reducing, limiting, or preventing vulnerability of people, property, and the environment to potentially damaging, harmful, or costly hazards. Hazard mitigation measures, which can be used to eliminate or minimize the risk to life and property, fall into three categories. The first categories are those that keep the hazard away from people, property, and structures. The second categories are those that keep people, property, and structures away from the hazard. The third categories are those that do not address the hazard at all, but rather reduce the impact of the hazard on the victims, such as insurance. This mitigation plan has strategies that fall into all three categories.

Hazard mitigation measures must be practical, cost effective, and environmentally and politically acceptable. Actions taken to limit the vulnerability of society to hazards must not in themselves be more costly than the value of anticipated damages.

The primary focus of hazard mitigation actions must be at the point at which capital investment decisions are made and based on vulnerability. Capital investments, whether for homes, roads public utilities, pipelines, power plants, chemical plants or warehouses, or public works, determine to a large extent the nature and degree of hazard vulnerability of a community. Once a capital facility is in place, very few opportunities will present themselves over the useful life of the facility to correct any errors in location or construction with respect to hazard vulnerability. It is for these reasons that zoning ordinances, which restrict development in high vulnerability areas, and building codes, which insure that new buildings are built to withstand the damaging forces of hazards, are the most useful mitigation approaches a city can implement.

Previously, mitigation measures have been the most neglected programs within emergency management. Since the priority to implement mitigation activities is generally low in comparison to the perceived threat, some important mitigation measures take time to implement. Mitigation success can be achieved, however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management. Hazard mitigation is the key to eliminating long-term risk to people and property living in Utah from hazards and their effects. Preparedness for all hazards includes response and recovery plans, training, development, management of resources, and the need to mitigate each jurisdictional hazard.

The State Division of Emergency Management and Homeland Security (DESHS) have identified the following hazards to be analyzed by each county. These hazards include avalanche, dam failure, debris flow, drought, earthquake, flood, flash flooding, infestation, landslide, problem soils, summer storm, tornado, urban and rural fires, and winter storm.

This regional/multi-jurisdictional plan evaluates the impacts, risks and vulnerabilities of natural hazards in a jurisdictional area affected by a disaster. The plan supports, provides assistance, identifies and describes mitigation projects for each annex. The suggestive actions and plan implementation for local and tribal governments could reduce the impact of future disasters. Only through the coordinated partnership with emergency managers, political entities, public works officials, community planners and other dedicated individuals working to implement this program was it accomplished.

To develop the mitigation plan, The Utah DESHS, based on the Governor's Office of Planning and Budget, the Utah League of Cities and Towns, and the U.S. Department of Housing and Urban Development, chose to use the planning services of the Utah Associations of Governments.
Seven regional Associations of Governments:

1. Bear River Association of Governments
2. Wasatch Front Association of Governments / Wasatch Front Regional Council
3. Mountainland Association of Governments
4. Six County Association of Governments
5. Southeast Utah Association of Local Governments
6. Southwestern / Five County Association of Governments
7. Uintah Basin Association of Governments

Scope

Six County Association of Governments, which encompasses much of Central Utah, including the counties of Juab, Millard, Piute, Sanpete, Sevier, and Wayne, was placed under contract by the Utah Division of Emergency Services to complete a Pre-Disaster Mitigation Plan, which meets the requirements of the Disaster Mitigation Act of 2000, for the areas they serve.

This plan is applicable of not only the six counties served by the Association but also for the cities, towns, and municipalities within each county. The plan also takes into account the five bands of the Paiute tribe. The scope of this plan only includes natural hazards defined as a concern to local counties and jurisdictions. These natural hazards identified by stack holders include: earthquakes, floods, landslides, wildfires, problem soils, dam failures, sever weather, and drought. Although there were the only hazards considered much of the data is applicable to other federally funded planning currently taking place. Planning included local level data for each incorporated area within the six counties.

Purpose

The purpose of the Six County Association of Government Natural Hazard Mitigation Plan is to fulfill federal, state, and local hazard mitigation planning responsibilities; to promote pre and post disaster mitigation measures, short/long range strategies that minimize suffering, loss of life, and damage to property resulting from hazardous or potentially hazardous conditions to which citizens and institutions within the state are exposed; and to eliminate or minimize conditions which would have an undesirable impact on our citizens, the economy, environment, and the well-being of the state of Utah. This plan is to aid in enhancing city and state officials, agencies, and public awareness to the threat hazards pose to property and life and what can be done to help prevent or reduce the vulnerability and risk to jurisdiction with in the Six County planning area.

Authority

Federal:

Public Law 93-288 as amended, established the basis for federal hazard mitigation activity in 1974. A section of this Act requires the identification, evaluation, and mitigation of hazards as a prerequisite for state receipt of future disaster assistance outlays. Since 1974, many additional programs, regulations, and laws have expanded on the original legislation to establish hazard mitigation as a priority at all levels of government. When PL 93-288 was amended by the Stafford Act, several additional provisions were also added that provide for the availability of significant mitigation measures in the aftermath of Presidential declared disasters. Civil Preparedness Guide 1-3, Chapter 6- Hazard Mitigation Assistance Programs places emphasis on hazard mitigation planning directed toward hazards with a high impact and threat potential.

President Clinton signed the Disaster Mitigation Act of 2000 into Law on October 30, 2000. Section 322, defines mitigation planning requirements for state, local, and tribal governments. Under Section 322 States are eligible for an increase in the Federal share of hazard mitigation (HMGP), if they submit for approval a mitigation plan, which is a summary of local and/or regional mitigation plans, that identifies natural hazards, risks, vulnerabilities, and describes actions to mitigate the hazards risks and vulnerabilities in that plan.

State:

- The Governor’s Emergency Operation Directive
- The Robert T. Stafford Disaster Relief and Emergency Assistance Act, amendments to Public Law 93-288, as amended.
- Title 44, CFR, Federal Emergency Management Agency Regulations, as amended.
- State Emergency Management Act of 1981, Utah Code 53-2, 63-5.

- Disaster Response Recovery Act, 63-5A.
- Executive Order of the Governor, Executive Order 11
- Emergency Interim Succession Act, 63-5B.

Six County Association of Governments:
The Associations of Governments have been duly constituted under the authority of Title XI, Chapter13, Utah Code Annotated, 1953, as amended (The Inter-local Cooperation Act) and pursuant to Section 3 of the Executive Order of the Governor of the State of Utah, dated May 27, 1970, with the authority to conduct planning studies and to provide services to its constituent jurisdictions.

Local:
Local governments play an essential role in implementing effective mitigation, both before and after disaster events. Each local government will review all damages, losses, and related impacts to determine the need or requirement for mitigation action and planning whenever seriously effected by a disaster, or when applying for state or federal recovery assistance. In the counties and cities making up the Six County Association of Governments the local executive responsible for carrying out plans and policies are the County Commissioners and City Mayors. Local governments must be prepared to participate in the post disaster Hazard Mitigation Team process and the pre-mitigation planning as outlined in this document.

Goals

One goal is to coordinate with each participating local government to develop a regional planning process meeting each plan component identified in the FEMA Region VIII Crosswalk document and any additional State planning expectation, both regionally and specifically, as needed, by gathering local input. Another goal is to reduce risk from natural hazards in Central Utah, through the implementation and updating of regional plans.

Short Term Goals

These goals form the basis for the development of the PDM Plan and are shown from highest priority, at the top of the list, to those of lesser importance nearer the bottom.

- Protection of life before, during, and after the occurrence of a disaster.
- Preventing loss of life and reducing the impact of damage where problems cannot be eliminated.
- Protection of emergency response capabilities (critical infrastructure)
- Communication and warning systems
- Emergency medical services and medical facilities
- Mobile resources
- Critical facilities
- Government continuity
- Protection of developed property, homes and businesses, industry, education opportunities and the cultural fabric of a community, by combining hazard loss reduction with the community's environmental, social and economic needs.
- Protection of natural resources and the environment, when considering mitigation measures.

- Promoting public awareness through education of community hazards and mitigation measures.
- Preserving and/or restoring natural features that provide mitigation such as floodplains.

Long Term Goals

- Eliminate or reduce the long-term risk to human life and property from identified natural and technologic hazards.
- Aid both the private and public sectors in understanding the risks they may be exposed to and finding mitigation strategies to reduce those risks.
- Avoid risk of exposure to identified hazards.
- Minimize the impacts of those risks when they can not be avoided
- Mitigate the impacts of damage as a result or identified hazards.
- Accomplish mitigation strategies in such away that negative environmental impacts are minimized.
- Provide a basis for funding of projects outlined as hazard mitigation strategies.
- Establish a regional platform to enable the community to take advantage of shared goals, resources, and the availability of outside resources. If an earthquake occurs outside of the county seat it will still affect the county seat. This is similar to many natural hazards.
- Establish a framework and database for the county seat to use to apply for aid.

Objectives

The following objectives are meant to serve as a measure upon which individual hazard mitigation projects can be evaluated. These criteria become especially important when two or more projects are competing for limited resources.

- Identification of persons, agency or organization responsible for implementation.
- Projecting a time frame for implementation.
- Explanation of how the project will be financed including the conditions for financing and implementing as information is available.
- Identifying alternative measures, should financing not be available.
- Be consistent with, support, and help implement the goals and objectives or hazard mitigation plans already in place for surrounding counties.
- Be based on the county seat Vulnerability Analysis.
- Have significant potential to reduce damages to public and/or private property and/or reduce the cost of, state, and federal recovery for future disasters.
- Be the most practical, cost-effective, and environmentally sound alternative after consideration of the options.
- Address a repetitive problem, or one that has the potential to have a major impact on an area, reducing the potential for loss of life, loss of essential services and personal.
- Property, damage to critical facilities, economic loss, and hardship or human suffering.
- Meet applicable permit requirements.
- Not encourage development in hazardous areas.

- Contribute to both the short and long term solutions to the hazard vulnerability risk problem.
- Assuring the benefits of a mitigation measure is equal to or exceeds the cost of implementation.
- Have manageable maintenance and modification costs.
- When possible, be designed to accomplish multiple objectives including improvement of life-safety risk, damage reduction, restoration of essential services, protection or critical facilities, security or economic development, recovery, and environmental enhancement.
- Whenever possible, use existing resources, agencies and programs to implement the project.

Environmental Considerations

Natural hazards are naturally occurring phenomena, only becoming natural disasters when humans and there structures become involved. The events themselves play an integral part in maintaining balance in our world. Meteorological, geological, and hydrological processes have shaped Utah for millions of years and will continue to shape the state for millions more years. Modern engineering has made it possible to prevent damage from natural hazards; however, the economic and environmental costs can be rather high. Tampering with natural systems can also create an imbalance in the natural environment. The effects of many of these imbalances are still unknown. It is better to live will a small amount of risk, respecting the natural process where appropriate, than to construct mitigation at every chance. Nature provides its own mitigation measures that need to be identified, protected and/or strengthened. To ensure that our environment is not harmed through mitigation projects all applicable city codes; county codes, state and federal laws pertaining to the environment will and must be followed. A description of all federal laws can be found in *Appendix D.*

Part II. Planning Process

Documentation of the Planning Process
This plan was prepared in the offices of the Six County Association of Governments by appointed staff members Planning Director, Emery Polelonema and Regional Planner, Edwin Benson, and was supported by Ryan Pietramali of DES. Other local agencies that have aided in the process include the city and county GIS departments of the Six County region. Elected officials including tribal leaders, local officials, emergency managers, police and fire staff members, planning departments, and local governmental agencies have all aided in the planning and implementation process. The planning process was based on Section 322 requirements of the Disaster Mitigation Act of 2000 and supporting guidance documents developed by FEMA and the Utah Division of Emergency Services and Homeland Security.
The planning process included the following steps.

1. Organize Resources
2. Public Officials Out Reach
3. Establish Continuity in Planning Process
4. Data Acquisition
5. Hazard Risk Identification and Analysis
6. County Vulnerability Assessment
7. Community Goals Assessment
8. Contact Regional Mitigation Emergency Managers (County & Tribal)
9. Mitigation Strategy Development
10. Prioritization of Identified Mitigation Strategies
11. State Plan Review
12. Adoption

Step 1: Organize Resources
The seven regional Associations of Governments (AOG) were recommended to conduct the planning efforts by the Utah League of Cities and Towns and the Governors office of Planning and Budget to ensure coordination with elected officials, emergency managers, planners, public works departments, and information technology specialists. Utah Division of Emergency Services and Homeland Security contracted the seven AOGs as sub-grantees to coordinate, develop, and write the seven multi-regional hazard mitigation plans under the planning guidelines included in the Disaster Mitigation Act of 2000.

Six County Association of Governments was contracted with by the Division of Emergency Services and Homeland Security (DESHS) to conduct the planning for the six-county region. The association worked closely with local jurisdictions to ensure their input was incorporated into the plan.

Six County Association of Governments designated a core planning team. The core planning team made up of members outlined in Table 2 were the main constituents of the planning process from the initiation of the plan to the development and coordination to the resolution of the plan's adoption. Adjunct to the core planning team a technical team committee was created on a technical level that is identified in Table 3. The Executive Board (Table 4) was utilized to assure and affirm their respective county local inputs.

County Pre-Disaster Mitigation Planning Teams were organized by Six County AOG to provide local input, review, and oversight of the PDM plan and planning process. The County Teams where made up of local, county, state, and AOG resources (see Tables 5-10). Coordination was maintained by the AOG, if cities and towns were not able to attend a meeting AOG staff emailed or sent pertinent items.

Many of the jurisdictions in the planning area have small populations and limited tax base, with most of the day-to-day running of the town conducted by volunteer elected officials. Getting participation from these jurisdictions proved difficult at times, due not to lack of interest, but because of limited time and resources. The AOG was familiar with this from past planning efforts and set up a process which enabled each jurisdiction to participate. Jurisdictions were met with individually to solicit comments; the plan was emailed or printed out and sent to jurisdictions that could not make it to the meetings. Six County AOG placed the plan on their website and encouraged local jurisdictions to review the numerous iterations. AOG staff also spent the month of October 2002 and again in October 2003 meeting will all 48 mayors and 18 commissioners in the planning area to explain why PDM was important and identify hazards. County Pre-Disaster Mitigation Planning Team members further aided in allowing participation of each jurisdiction in their County. Through this process each jurisdiction was able to participate in completing this mitigation plan.

Table 2: Core Planning Team

Name	Organization
Edwin Benson	Six County Association of Government
Emery Polelonema	Six County Association of Government
Ryan Pietramali	Division of Emergency Services and Homeland Security

Table 3: Technical Team Committee

Name	Organization
Ryan Pietramali	Utah Division of Emergency Services and Homeland Security
Lane Nielson	Wasatch Front Regional Council
LaNiece Dustman	Wasatch Front Regional Council
Jeff Adams	Southeastern Utah Association of Governments
Jim Boes	Wasatch Front Regional Council
Jeff Gilbert	Bear River Association of Governments
Ken Sizemore	Five County Association of Governments
Curt Hutchings	Five County Association of Governments
Andrew Jackson	Mountainland Association of Governments
Emery Polelonema	Six County Association of Governments
Edwin Benson	Six County Association of Governments
Yankton Johnson	Uintah Basin Association of Governments

Table 4: Executive Board

Name	Organization
Boyd Howarth	Juab County Commissioner
John Cooper	Millard County Commissioner
Paul Morgan	Piute County Commissioner, Chair
Bruce Blackham	Sanpete County Commissioner
Doug Peterson	Sevier County Commissioner
Clenn Okerlund	Wayne County Commissioner
Chad Brough	Mayor Nephi
Sam Starley	Mayor Fillmore
Gary James	Mayor Marysvale
Chesley Christensen	Mayor Mt. Pleasant
Jake Albrecht	Mayor Glenwood
Stan Alvey	Mayor Hanksville

County Pre-Disaster Mitigation Planning Teams:

Table 5: Juab County Pre-Disaster Mitigation Planning Team

Name	Representing:
Fred Smalley, Emer. Mgr.	Juab County
Wm. Boyd Howarth, Commissioner	Juab County
Robert Steele, Commissioner	Juab County
Neil Cook, Commissioner	Juab County
Lloyd Conder, Mayor	Eureka
Robert Shepherd, Mayor	Levan
Bryce Lynn, Mayor	Mona
Chad Brough, Mayor	Nephi
Darrell Allred, Mayor	Rocky Ridge
Kelly Allen	Forestry, Fire, and State Lands (FFSL)
Emery Polelonema	Six County Association of Governments (SCAOG)
Edwin Benson	SCAOG

Table 6: Millard County Pre-Disaster Mitigation Planning Team

Name	Representing:
Forrest Roper, Emer. Mgr.	Millard County
John Cooper, Commissioner	Millard County
Craig Greathouse, Commissioner	Millard County
Daren Smith, Commissioner	Millard County
Gayle Bunker, Mayor	Delta
V.B. “Sam” Starley, Mayor	Fillmore
Donald Brown, Mayor	Hinckley
Brent Bennett, Mayor	Holden
Terry Higgs, Mayor	Kanosh
Jim Rasch, Mayor	Leamington
Jese Ruiz, Mayor	Lynndyl
Jim Talbot, Mayor	Meadow

Name	Representing:
Winston Nielson, Mayor	Oak City
Burtis Quarnberg, Mayor	Scipio
Kelly Allen	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Table 7: Piute County Pre-Disaster Mitigation Planning Team

Name	Representing:
Ryan Horton, Emer. Mgr.	Piute County
Paul Morgan, Commissioner	Piute County
Tarval Torgersen, Commissioner	Piute County
W. Kay Blackwell, Commissioner	Piute County
Joe Dalton, Mayor	Circleville
Rick Dalton, Mayor	Junction
Carlos Jessen, Mayor	Kingston
Gerald James, Mayor	Marysvale
Terry Heath	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Table 8: Sanpete County Pre-Disaster Mitigation Planning Team

Name	Representing:
Kevin Holman, Emer. Mgr.	Sanpete County
Bruce Blackham, Commissioner	Sanpete County
Greg Dettinger, Commissioner	Sanpete County
Claudia Jarrett, Commissioner	Sanpete County
Darwin Jensen, Mayor	Centerfield
Morris Casperson, Mayor	Ephraim
Don Worley, Mayor	Fairview
Shawn Crane, Mayor	Fayette
Scott Collard, Mayor	Fountain Green
Scott Hermansen, Mayor	Gunnison
Kim Anderson, Mayor	Manti
Doug Bjerregaard, Mayor	Mayfield
L. Scott Robertson, Mayor	Moroni
Chesley Christensen, Mayor	Mt. Pleasant
John Thomas, Mayor	Spring City
Steven Thomas, Mayor	Sterling
Byron Davis, Mayor	Wales
Fred Johnson	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Table 9: Sevier County Pre-Disaster Mitigation Planning Team

Name	Representing:
Jim Porter, Emer. Mgr.	Sevier County
Doug Peterson, Commissioner	Sevier County
Gary Mason, Commissioner	Sevier County
Ralph Okerlund, Commissioner	Sevier County
Dale Albrecht, Mayor	Annabella
Lawrence Mason, Mayor	Aurora
Valerie Hopper, Mayor	Elsinore
Jake Albrecht, Mayor	Glenwood
Robert Owen, Mayor	Joseph
Harlow Brown, Mayor	Koosharem
Craig Mathie, Mayor	Monroe
Linda Mickelsen, Mayor	Redmond
Woody Farnsworth, Administrator	Richfield
Marilyn Anderson, Mayor	Salina
James Freeby, Mayor	Sigurd
Terry Heath	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Table 10: Wayne County Pre-Disaster Mitigation Planning Team

Name	Representing:
Vicky Bower, Emer. Mgr.	Wayne County
Clenn Okerlund, Commissioner	Wayne County
Allen Jones, Commissioner	Wayne County
Scott Durfey, Commissioner	Wayne County
Sherwood Albrecht, Mayor	Bicknell
Stan Alvey, Mayor	Hanksville
Ellis Brown, Mayor	Loa
Vanor Okerlund, Mayor	Lyman
Fred Hansen, Mayor	Torrey
Terry Heath	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Step 2: Public Officials Outreach
To ensure the planning process had backing from the elected officials a representative from Six County Association of Governments met with each County Commission and each city mayor to inform them of the need for the plan and how it can better help the communities (refer to *Appendix H*). With local support in place the plan was introduced to commissioners and other elected officials along with public entities by means of an informational website created by the Six County Association of Governments (http://www.sixcounty.com/six%20county%20web%20page/Planning/Reg_Planning/regional_planning.htm).

Step 3: Establish Continuity in the Planning Process
Mitigation planning within Six County Association of Governments was part of a Pre-Disaster Mitigation Planning initiative to meet the requirements of the Disaster Mitigation Act of 2000. To meet this requirement the seven Associations of Government were contracted by the Division of Emergency Services and Homeland Security to assist the 29 counties with completion of a mitigation plan, which meets the requirements of sections 322. The Seven Associations of Government formed a Technical Team Planning committee to share ideas and ensure the plans were similar and that there was little duplication of effort. Planners from the Six County Association of Governments were involved with this committee. Please refer to Table 3 above.

Step 4: Data Acquisition
Contact was made with designated personnel in each city and county to assess what data was available on the local level. Agreements were put in place, where needed, to allow the Association of Governments planning staff use of county and city data. Data layers obtained included some or all of the following: local roads, plot maps, county tax assessor's data, hazard data, flood maps, topographic data, aerial photographs, and land development data.

Step 5: Hazard Risk Identification and Analysis
This step was conducted by gathering data on the hazards that occurred in the planning area. This information was gathered from local, state, and federal agencies and organizations, as well as, from newspaper and other local media accounts, state and local weather records, conversations, surveys, interviews, and meetings with key informants within the planning area. Mitigation discussions were held during this process and are explained in further detail in Table 11 below. During these meeting attendees had the opportunity to review the general information on previous hazards and comment on them in a more specific manner. These meeting also provided a forum for discussion on the background information that was needed to gain a general understanding of the geography, geology, recreation, natural resources, and water resources of the Planning Area. These initial contacts with local entities also provided visual understanding of the planning area for planners of the Core Planning Team.

Table 11: Six County Association Governments Pre-Disaster Mitigation Planning Process Timeline

Date	Activity	Purpose
March 29, 2002	Letter of Intent that identifies the seven Associations of Governments as sub-grantees of the state to write the PDM plans. The AOGs were chosen by the Utah Interagency Technical Team who are a part of Nature-Safe Utah (Utah's Pre-Disaster Mitigation Program).	Continue the relationship with local council members and municipalities.
May 15-16, 2002	Utah's first regional mitigation planning training piloted toward the seven AOGs	Establish a guideline and timeframe.
July 12,2002	News Release from Governor Michael Leavitt announcing the new program to develop local hazard mitigation plans statewide.	Conduct public awareness and involvement.
August, 2002	Gather information.	Data Collection.
September 10, 2002	Meeting. Met with all AOGs and DESHS to discuss the planning process.	Identify planning team and available resources.
September 30, 2002	Contacted Emergency Managers in the Six County region.	Identify level of involvement.
October-November, 2002 (see *Appendix H*)	Met with all six county commissions and 48 mayors in the Six County region to identify hazards.	Hazard Identification. Went over questionnaires with mayors and commissioners.
November 2002	Gathered community data for regional data section of the plan.	Data Collection.
November 6, 2002	Public Meeting. Met with Six County Association of Governments Executive Board.	Obtain Approval to conduct mitigation planning.
November 22, 2002	Meeting. Met with technical team members.	Solicit public involvement, Army Corps proposal for flood study, GIS training, timeline, review the regional plans
December, 2002	Gathering data.	Data Collection
January, 2003	Gathering data.	Data Collection.
January 22, 2003	Public Meeting. AOG executive director's meeting.	Signed contracts for Army Corps flood proposal.
February 27, 2003	Meeting. Met with technical team members in St. George.	Review of plans, mapping.
March, 2003	Information gathering	Data Collection, plan

Date	Activity	Purpose
April, 2003	Drafting of the plan.	For review.
May 14, 2003	Meeting. SCAOG Executive Board meeting.	Discussion of progress; plans to DESHS by December with additional money.
May 22, 2003	Meeting. Met with technical team members at DESHS.	Progress report, deadlines, mapping, mitigation actions, internal webpage.
May, 2003	Gather mapping data.	Complete hazard identification and profile.
June, 2003	Website addressing Natural Hazards.	Public involvement and comment.
July 17, 2003	Meeting. Met with technical team members in Orem City.	Discussed mapping and plan review.
August 22-23, 2003	Fire Planning Meeting in Ephraim.	Public involvement facilitated by Six County Planning Staff.
August 29, 2003	Fire Planning Meeting at Indian Ridge Subdivision in North Sanpete County	Volunteers from six communities came together to write a Fire Plan (included in *Appendix F)* facilitated by Six County Planning Staff.
October 1, 2003	Discussed Draft of PDM Plan with Exec. Board	Public meeting with Exec. Board.
October 1, 5, & 12, 2003	Met with Paiute Tribe Emergency Mangers and Band Councils	Public Tribal and Band Council Meeting. Discussed PDM and review of draft.
October-November, 2003 (see *Appendix H*)	Met with all six county commissions and 48 mayors in the Six County region.	Hazard Identification. Reviewed draft plan with mayors and commissioners.
December 11, 2003	Met with Sanpete County's Pre-Disaster Mitigation Committee (Kevin Holman, Emergency Mgr., Fred Johnson, Fire Warden, Ty Bailey, State LNO)	Determined a course of action in order to develop a mitigation plan and funding for mitigation. Identified problems, set goals and recorded objectives.
December 23, 2003	Met with Millard County's Emergency Mgr., Forrest Roper	Decided upon mitigation projects that would most benefit Millard County.
December 23, 2003	Met with Kanosh Band's Emergency Mgr., McKay Pikyavit	Decided upon mitigation projects that would most benefit the Kanosh Band of the Paiute Tribe of Utah.

Step 6: County Vulnerability Assessment
This step was conducted through a review of local base maps, topographical maps, floodplain maps, and other data. A detailed vulnerability analysis was completed with the use of Geographic Information Systems for each county within the Six County Association of Governments. HAZUS MH was used to determine vulnerability to earthquakes, for the hazards such as floods, landslides, and wildfire of loss estimation methodology was developed by the core planning team, with assistance from the Technical Team, to determine vulnerability to hazards. Each county section explains the data sources and the methodology used can be found in *Appendix B.* During these meetings attendees had the opportunity to review the specific information on all GIS products and to review areas of vulnerability in association with specific hazards.

Step 7: Community Goals Assessment
This step was conducted through a review of the governing documents of the planning area, as well as, conversations, interviews, and meetings with key responsible individuals within the planning area. This step identified what goals are already established and adopted for the planning area and whether or not they promote or deter mitigation activities.

Step 8: Contact Regional Mitigation Emergency Managers (County & Tribal)
Juab, Millard, Piute, Sanpete, Sevier, and Wayne counties along with their respective communities were contacted to ascertain mitigation strategies. These counties and communities have volunteers and individuals with an interest in mitigation and public employees with technical expertise pertinent to mitigation. They include elected officials, county/city planners, county staff, and emergency managers. County emergency managers and their assistants were tasked with completing the Mitigation Strategies Workbook issued by the State Division of Emergency Services and Homeland Security. The Paiute Tribal emergency response council was also assigned to complete the workbook.

Step 9: Mitigation Strategy Development
Developing the mitigation strategies was a process in which all of the previous steps were taken into account. Each County that participated in the County Pre-Disaster Mitigation Planning Grant was asked to evaluate the vulnerability assessment completed by Six County Association of Governments and complete a Mitigation Strategies Workbook that can be found in the annexes for each county.

Step 10: Prioritization of Identified Mitigation Strategies
The Disaster Mitigation Act of 2000 requires state, tribal, and local governments show how mitigation actions were evaluated and prioritized. This was completed by the AOGs with assistance from each county and city. Prioritization was done using the STAPLEE method explained in the FEMA How to Guide, 386-3, April 2003 (available online at http://www.fema.gov/fima/planning_howto3.shtm). Additionally, jurisdictions reviewed the prioritization and understood that a benefit/cost analysis would aid in determining the true benefit to cost of each project. Prior to grant submittal a benefit/cost analysis would be completed for each project. At this time funding reality limited the project development, preventing a proper benefit/cost analysis from being conducted.

Step 11: State Review
The Division of Emergency Services and Homeland Security pulled together a formal PDM plan review committee to insure local plans met the requirements of DMA 2000. This committee reviewed the plans from October 15 through November 1, 2003 and again from January 1 to January 15, 2004 subsequent to submission to FEMA for final review and acceptance.

Step 12: Adoption
The plan went through a public hearing process on (date) and was adopted by:

Juab County

- Eureka City, Town of Levan, Mona City, Nephi City, and Rocky Ridge.

Millard County

- Delta City, Fillmore City, Town of Hinckley, Town of Holden, Town of Kanosh, Town of Leamington, Town of Lynndyl, Town of Meadow, Town of Oak City, and Town of Scipio.

Piute County

- Town of Circleville, Town of Junction, Town of Kingston, and Town of Marysvale.

Sanpete County

- Town of Centerfield, Ephraim City, Fairview City, Town of Fayette, Fountain Green City, Gunnison City, Manti City, Town of Mayfield, Moroni City, Mt. Pleasant City, Spring City, Town of Sterling, and Town of Wales.

Sevier County

- Town of Annabella, Aurora City, Town of Elsinore, Town of Glenwood, Town of Joseph, Town of Koosharem, Monroe City, Town of Redmond, Richfield City, Salina City, and Town of Sigurd.

Wayne County

- Town of Bicknell, Town of Hanksville, Town of Loa, Town of Lyman, and Town of Torrey.

A. Public Involvement

Public involvement opportunities were available throughout the design and completion of this plan. Such opportunities included a public website for comment and review (http://www.sixcounty.com/six%20county%20web%20page/Planning/Reg_Planning/regional_planning.htm) and public meetings (refer to Table 11). Public comments taken from these public meetings were incorporated into the plan. Emergency managers, the Fire Department, Sheriff Department, State and Local Agencies, all community members that could be affected by a hazard within the region, business leaders, educators, non-profit organizations, private organizations, and other interested members were all a part of the planning process. It should be noted that in the rural setting of the region, most community planning and development occur in a collaborative effort. For example, the elected officials are business professionals and governmental officials (i.e. CPA's, School Administrators, small business owners, et al.), thus in one meeting a broad spectrum of interested parties are allowed the opportunity to comment. The Six County Executive Board meetings are open to the public and attendees during these dialogues have the opportunity to comment. The county commission meetings are announced as open meetings, as well as, the city council meetings. County community and economic development professionals also have input during their regular meetings. In summation, SCAOG staff indeed provided a wide-open comment opportunity for all interested parties through these public venues.

B. Information Sources

The following sources were look at during the completion of this plan:

- Federal Emergency Management Agency (How-to Guides).
- National Weather Service (Hazard profile).
- National Climate Data Center (Drought, Severe Weather)
- Army Corps of Engineers (Flood data).
- Utah Division of Emergency Services and Homeland Security (Salt Lake City Mitigation Plan, GIS data, Flood data, HAZUS data for flood and earthquake).
- Utah Geologic Survey (GIS data, Geologic information).
- Utah Division of Forestry, Fire and State Lands (Fire data).
- Utah Avalanche Center, Snow and Avalanches in Utah Annual Report 2001-2002 Forest Service.
- Utah Automated Geographic Resource Center (GIS data).
- University of Utah (drought climate charts from internship students).
- University of Utah Seismic Station (Earthquake data).
- Utah State University (climate data).
- Councils or Government
- Association of Governments
- Juab County and municipalities (Juab County Water Master Plan, Emergency Operations Plans, Histories, mitigation actions, public input, GIS data, Assessor data, Transportation data, Property and Infrastructure data).
- Millard County and municipalities (Millard County Water Master Plan, Emergency Operations Plans, Histories, mitigation actions, public input, GIS data, Assessor data, Transportation data, Property and Infrastructure data).
- Piute County and municipalities (Municipal Water Plans, Greenwich Water Plan, Emergency Operations Plans, Histories, mitigation actions, public input, GIS data, Assessor data, Transportation data, Property and Infrastructure data).
- Sanpete County and municipalities (Sanpete County Water Master Plan, Emergency Operations Plans, Histories, mitigation actions, public input, GIS data, Assessor data, Transportation data, Property and Infrastructure data).
- Sevier County and municipalities (Sevier County Water Master Plan, Emergency Operations Plans, Histories, mitigation actions, public input, GIS data, Assessor data, Transportation data, Property and Infrastructure data).
- Wayne County and municipalities (Wayne County Water Master Plan, Emergency Operations Plans, Histories, mitigation actions, public input, GIS data, Assessor data, Transportation data, Property and Infrastructure data).

Other Plans:

- Earthquake Safety in Utah
- Utah Natural Hazard Handbook
- Utah Statewide Fire Risk Assessment Project
- A Strategic Plan for Earthquake Safety in Utah

- Natural Disaster Analysis, State of Utah Office of Emergency Services 1976
- State of Utah Mitigation Plan 1999 and 2001
- State of Utah Wildfire Plan 2002
- State of Utah Drought Plan
- State of Utah Water Plan
- Salt Lake City Mitigation Plan 2002
- Planning for a Sustainable Future
- Town of Merrimack, NH Hazard Mitigation Plan 2002
- Clackamas County Mitigation Plan 2002
- Hazard Mitigation Plan Dunkerton, Iowa
- Dunn County North Dakota Multi-Hazard Mitigation Plan 2001
- Jefferson County West Virginia All Hazard Mitigation Plan 2003

Plan Methodology

The information in this mitigation plan is based on research from a variety of sources. SCAOG/DES conducted data research and analysis, facilitated steering committee meetings and public workshops, developed the final mitigation plan, and presented the plan for formal adoption with participating jurisdictions. The research methods and various contributions to the plan include:

State and federal guidelines and requirements for mitigation plans:
During the completion of this plan SCAOG examined and followed state and federal guidelines and requirements. These guidelines included FEMA planning standards, National Flood Insurance Program's Community Rating system, FEMA Flood Mitigation Assistance Program and various State reference material. A list of guidelines and requirements is as follows:

- FEMA 386-1,2,3,4,5,6,7,8,9
- FEMA Post Disaster Hazard Mitigation Planning Guidance DAP-12
- Disaster Mitigation Act of 2000
- 44 CRF parts 201 and 206, Interim Final Rule
- FEMA Region VIII "crosswalk"

Previous plans and studies:
SCAOG examined existing mitigation plans from around the country and incorporated numerous plans and studies from within the jurisdictions they serve. These plans include:

- West Colorado River Basin Plan
- West Desert Basin Plan
- Sevier River Basin Plan
- Manti City Flood Insurance Study
- Elsinore City Flood Insurance Study
- Town of Joseph Flood Insurance Study
- Richfield City Flood Insurance Study
- Salina City Flood Insurance Study
- Sevier River and Tributaries, Utah Reconnaissance Report US Army Corp of Engineers March 1994

- Flood Damage Prevention Study Sevier River Basin Investigation, Utah US Army Corp of Engineers January 1994.
- Utah Statewide Fire Risk Assessment Project
- Natural Disaster Hazard Analysis, State of Utah Office of Emergency Services 1976
- Salt Lake City Mitigation Plan 2002
- State of Utah Mitigation Plan 1984, 1985, 1999 and 2001
- State of Utah Wildfire Plan 2002
- State of Utah Drought Plan
- State of Utah Water Plan
- Six County Flood Hazard Identification Study
- Emergency Operations Plans for Juab, Millard, Piute, Sanpete, Sevier, and Wayne Counties.
- University of Utah Seismograph Stations History of Utah Earthquakes
- National Weather Service "Flood and Flash Flood Deaths in Utah"
- Snow and Avalanches in Utah Annual Report 2001-2002 Forest Service Utah Avalanche Center.
- Town of Merrimack, New Hampshire Hazard Mitigation Plan 2002
- Clackamas County Mitigation Plan 2002
- Dunn County North Dakota Multi-Hazard Mitigation Plan 2001

Hazard Specific Research and Vulnerability Analysis Methodology

Geographic Information Systems (GIS) were used as the basic analysis tool to complete the hazard analysis for the Six County Association of Governments Pre-disaster Mitigation Plan. For most hazards a comparison was made between digital hazard data and census 2000 demographic information. Fortunately digital data exist statewide for landslides, quaternary faults, wildfire, dam locations, and epicenter locations. The goal of the vulnerability study is to estimate the number of homes, and infrastructure vulnerable to each hazard and assign a dollar value to this built environment. To this end, census data and natural hazard maps are the basic information used in the analysis. All the analysis takes place within the spatial context of a GIS. With the information available in spatial form, it is a simple task to overlay the natural hazards with census data to extract the desired information.

Earthquakes

HAZUS MH shorthand for Hazards United States Multi-Hazard was used to determine vulnerability as it relates to seismic hazards for the study area. The HAZUS-MH Earthquake Model is designed to produce loss estimates for use by federal, state, regional and local governments in planning for earthquake risk mitigation, emergency preparedness, response and recovery. The methodology deals with nearly all aspects of the built environment, and a wide range of different types of losses. Extensive national databases are embedded within HAZUS-MH, containing information such as demographic aspects of the population in a study region, square footage for different occupancies of buildings, and numbers and locations of bridges. Embedded parameters have been included as needed. Using this information, users can carry out general loss estimates for a region. The HAZUS-MH methodology and software are flexible enough so that locally developed inventories and other data that more accurately reflect the local environment can be substituted, resulting in increased accuracy.

Uncertainties are inherent in any loss estimation methodology. They arise in part from incomplete scientific knowledge concerning earthquakes and their effects upon buildings and facilities. They also result from the approximations and simplifications that are necessary for comprehensive analyses. Incomplete or inaccurate inventories of the built environment, demographics and economic parameters add to the uncertainty. These factors can result in a range of uncertainty in loss estimates produced by the HAZUS-MH Earthquake Model, possibly *at best* a factor of two or more.

The methodology has been tested against the judgment of experts and, to the extent possible, against records from several past earthquakes. However, limited and incomplete data about actual earthquake damage precludes complete calibration of the methodology. Nevertheless, when used with embedded inventories and parameters, the HAZUS-MH Earthquake Model has provided a credible estimate of such aggregated losses as the total cost of damage and numbers of casualties. The Earthquake Model has done less well in estimating more detailed results - such as the number of buildings or bridges experiencing different degrees of damage.

Such results depend heavily upon accurate inventories. The Earthquake Model assumes the same soil condition for all locations, and this has proved satisfactory for estimating regional losses. Of course, the geographic distribution of damage may be influenced markedly by local soil conditions. In the few instances where the Earthquake Model has been partially tested using actual inventories of structures plus correct soils maps, it has performed reasonably well.

Landslides and Wildfire

The methodology used to determined vulnerability for landslides and wildfire within the study area was almost identical. Demographic information from census 2000 was manipulated to obtain vulnerability numbers. The methodology used, assumes and even distribution of built housing across the county and each city within the county. Assuming even distribution a housing density was determined by dividing the total number of homes (census 2000) by the total number of acres. For example the Town of Eureka in Juab County is 940 acres in size and contains 342 housing units. Thus the housing density is .364 i.e. each acre contains .364 housing units.

From this point the number of acres of extreme, high, and moderate wildfire along with acres of historically active landslides were determined for each city and the unincorporated county. Once and acre total was know it was multiplied by the density value for each particular city or county to determine the total number of homes. This new figure was then multiplied by the average housing value as reported by the County assessors office, to determine the total value of potential loss residents. In the case of wildfire the value of the land (20% of total) was subtracted from the totals reported in the vulnerability tables. This was done because wildfires do not render the land useless as landslides often do. Additionally content values are not included, which would raise the potential loss numbers for housing by approximately 50%.

Table 12: Assessor Land Values

County	Assessor Land Value
Juab	95,000
Millard	72,000
Piute	75,000
Sanpete	95,000
Sevier	90,000
Wayne	75,000

Transportation and utilities information was determined using the Geoprocessing Wizard, an extension in ArcView 3.2. This extension allows the GIS user to clip one theme based on another. For example the roads theme was clipped by the landslide theme, resulting in a new shape file containing all of the roads within a historically active landslide area. The new database was then queried through several simple equations to determine the length in miles of each linear feature (pipelines, electric lines, and roads). Once the length of vulnerable infrastructure was determined it was multiplied by cost estimate information from HAZUS MH and the Utah Department of Transportation. These costs include:

Table 13: Transportation/Utilities Cost per Mile

Item	Cost per Mile
Local Roads	2,413,000
State Highways	2,413,500
US Highways	2,413,500
US Interstates	3,600,000
Power Lines	48,280
Gas Lines	241,390

In addition to the linear features point data such as critical facilities, dams, care facilities, schools, power generation facilities, and substations were analyzed to determine if the feature was within a hazard area. Where point data was determined to be within a hazard area the following values from HAZUS MH were assigned:

Table 14: Power Generation Facilities/Substations Costs

Item	Cost
Small Power Plant	100,000,000
Large Power Plant	500,000,000
Low Voltage Substation 115 KV	10,000,000
Medium Voltage Substation 230 KV	20,000,000
Large Voltage Substation 500 KV	50,000,000

(Facility value was assigned based on Square footage.)

Limited availability of digital data represented a problem in completing the vulnerability assessment. Potential loss numbers were only determined for earthquakes, landslides, and wildfires in this plan. Additional limitations to the above described analysis method includes:

- Assuming random distribution
- Limited data sets for water, gas, electrical, resulting in, incomplete numbers for these features.
- Lack of digital parcels data from the county assessors office.
- HASUZ MH is not designed for small population counties.
- No digital data for dam failure inundation, flood plains, or infestation.
- Relied on state wide data not intended for manipulation at the scale it was used.
- Data was not field checked, resulting in an analysis wholly dependent on accuracy of data.
- Meta data was lacking on some of the used data sets.

In terms of hazard mapping presentation in this document, simple maps were created to provide a graphical illustration of location. These maps are done at a scale, which allows them to fit on a standard letter sized page rendering the useless. Larger maps can be plotted out upon request. Data manipulation and maps were created as a planning tool, to be used, by interested persons within the Six County Association of Governments and the jurisdictions the AOG serves. This information should not take the place of accurate field verified mapping from which ordinances need to be based off of.

Effort to analyze hazards related to potential future development areas was also addressed where applicable. This proved to be a very difficult exercise and at best can only identify areas, which need additional research before development should be allowed. No viable source of data exists for this study area to facilitate analysis of future development. Limited zoning data was available but this data does not necessarily indicate which, areas will be developed and which will not.

Part III. General Regional Data

Six County Association of Governments

As the name states the Six County Association of Governments is comprised of six Utah Counties: Juab, Millard, Piute, Sanpete, Sevier, and Wayne. This plan incorporates the following entities within each county. Also, the Paiute Indian Tribe of Utah is an integral entity within the State of Utah and the six-county region.

Juab County

Contained within Juab County are five incorporated areas: Eureka City, Town of Levan, Mona City, Nephi City, and Rocky Ridge Town.

Millard County

There are ten incorporated municipalities within Millard County: Delta City, Fillmore City, Hinckley Town, Holden Town, Kanosh Town, Leamington Town, Lynndyl Town, Meadow Town, Town of Oak City, and Scipio Town.

Piute County

Contained within Piute County are four municipalities: the Town of Circleville, Junction Town, Kingston Town, and Marysvale Town.

Sanpete County

Sanpete County the most populous county in the Six County region contains 13 municipalities: Centerfield Town, Ephraim City, Fairview City, Town of Fayette, Fountain Green City, Gunnison City, Manti City, Mayfield Town, Moroni City, Mt. Pleasant City, Spring City, Town of Sterling, and Wales Town.

Sevier County

Within Sevier County are eleven municipalities: Annabella Town, City of Aurora, Elsinore Town, Glenwood Town, Joseph Town, Koosharem Town, Monroe City, Redmond Town, Richfield City, Salina City, and the Town of Sigurd.

Wayne County

Within Wayne County are five municipalities: Bicknell Town, Hanksville Town, Loa Town, Lyman Town, and Torrey Town.

Paiute Indian Tribe of Utah

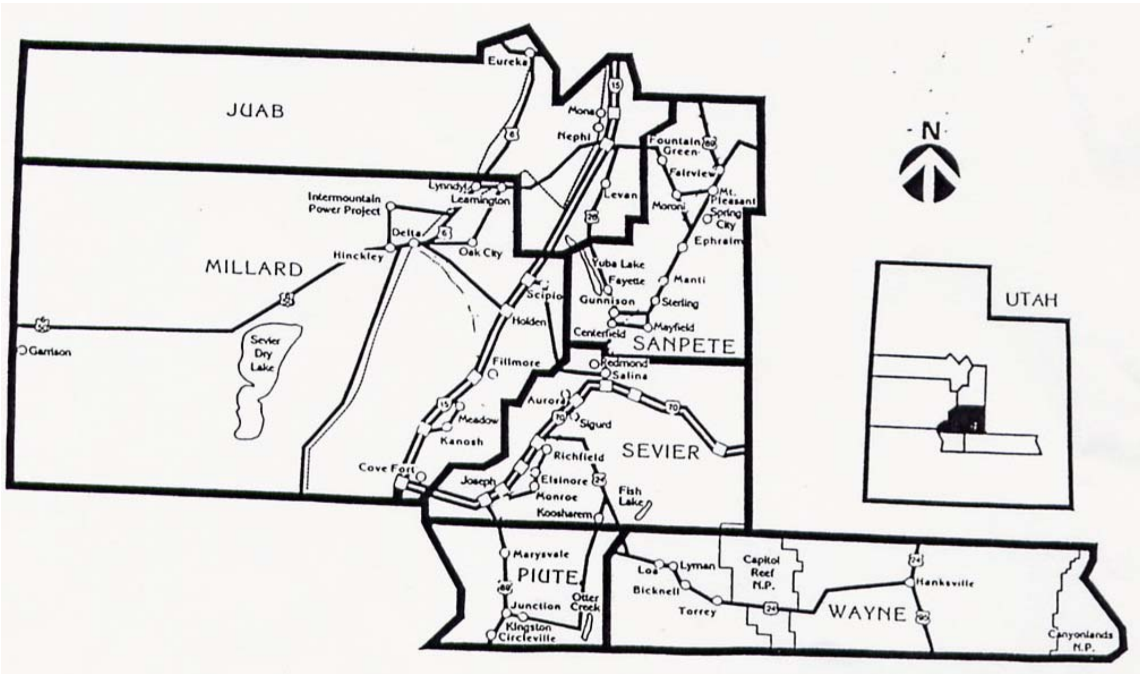
The Paiute Tribe has two bands of the tribe located in the Six County Region. These Bands include the Koosharem in Sevier County and the Kanosh Band in Millard County. Detailed information on their demographics and other vital economic statistics is found in *Appendix M*.

Geographic and Physiographic Background

The Six County region is located in the center of the state of Utah. It comprises six counties including Juab, Millard, Piute, Sanpete, Sevier and Wayne. *See Figure 1, Central Utah's Six Counties.* It is geographically located approximately 500 miles from

Denver, Colorado; 600 miles from Los Angeles, California; and 600 miles from Phoenix, Arizona. Travel time from the District Offices in Richfield to County Economic Development Offices in Nephi, Delta, Junction, Ephraim, Richfield, and Loa are: 90 minutes, 80 minutes, 45 minutes, 60 minutes, 0 minutes, and 50 minutes respectively. Interstates 15 and 70 serve the Six County region.

Figure 1: Six County Region



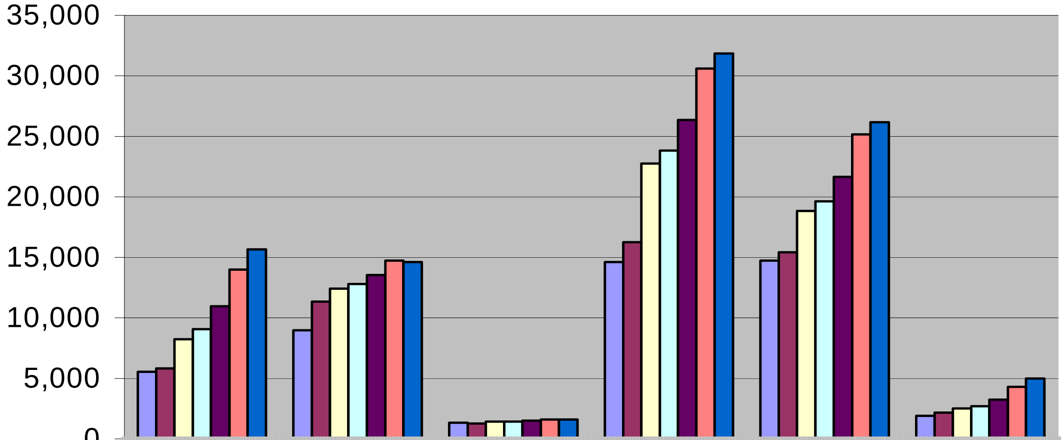
The Six County region contains 16,698 square miles making it the second largest region in the state of Utah behind Southeastern. However, Six County encompasses 96% of the area of Southeastern and makes up just over 20% of the land area of the entire state of Utah. Putting this in perspective, you could fit the states of New Hampshire and New Jersey within Six County's borders and still have room for all of Davis County, Utah. In addition, the combined population of New Hampshire, New Jersey, and Davis County is 9,889,130 which is more than 142 times Six County's 69,478. The varied landscape has been divided into four major physiographic provinces: the **Basin and Range Province** of the western part; the **Middle Rocky Mountain Province** which includes the Wasatch Range in the extreme north; the **Colorado Plateau Province** of canyons, mountains, and plateaus in the east; and the **Basin and Range-Colorado Plateau Transition** in the center of the Six County region. The last area is also known as the "High Plateaus" and shares structural features such as faults with its eastern and western neighbors.

Most of the Six County region is dry. The Great Basin and Colorado Plateau receive the least amount of precipitation, about 5-10 inches annually. The transition zone in the center, which has the highest population density, averages about 13 inches of annual precipitation. However, rainwater runs quickly off the rocky desert surfaces and into gullies and canyons. Flash floods can form and sweep away anything in their path, including boulders, cars, and campsites. Summer lightning causes forest and brush fires threatening the wide variety of flora and fauna, as well as cabins and homes, in the area.

Demographics

According to 2003 population estimates, 69,478 people live in the Six County region. This compares to 47,087 in 1980, 52,294 in 1990 and 66,192 in 2000. All counties within the region have experienced growth over the past two decades. *See Chart 1, County Population Comparisons*

Chart 1: County Population Comparisons



	JUAB	MILLARD	PIUTE	SANPETE	SEVIER	WAYNE
1980	5,530	8,970	1,329	14,620	14,727	1,911
1990	5,817	11,333	1,277	16,259	15,431	2,177
2000	8,238	12,405	1,435	22,763	18,842	2,509
2003	9,067	12,805	1,443	23,831	19,631	2,701
2010	10,954	13,538	1,508	26,351	21,649	3,256
2020	13,996	14,730	1,606	30,611	25,159	4,286
2030	15,660	14,605	1,588	31,860	26,174	4,987

Source: U.S. Census Bureau / Governor's Office of Planning & Budget 2000 Baseline Projections / Six County Planning Estimates

Diversity in the ethnic composition of the Six County Region has increased over the past 20 years. Industrial growth utilizing workers from minority populations has contributed to this change. *See Table 15, Ethnic Composition of the Six County Region.*

Table 15: Ethnic Composition of the Six County Region.

	1980	% 1980	1990	% 1990	2000	% 2000	% Increase (1980-2000)
White	45869	97.4%	50389	96.4%	62475	94.4%	36%
African American	28	0.1%	22	0.0%	153	0.2%	446%
American Indian	533	1.1%	767	1.5%	848	1.3%	59%
Asian	222	0.5%	391	0.7%	382	0.6%	72%
Hispanic	435	0.9%	1364	2.6%	3213	4.9%	639%

Source: U.S. Census Bureau

Tables 16-21 contain population change and projection data through 2030.

Table 16: Population Projections / Future Growth

	1990 Census Pop.	2000 Census Pop.	Absolute Change 1990-2000	Percent Change 1990-2000	AARC 1990-2000	Rank by 2000 Pop.	Rank by Absolute Change	Rank by Percent Change	Rank by AARC
Juab County	5,817	8,238	2,421	41.6%	3.5	21	15	6	6
Millard County	11,333	12,405	1,072	9.5%	0.9	18	21	27	27
Piute County	1,277	1,435	158	12.4%	1.2	28	29	26	26
Sanpete County	16,259	22,763	6,504	40.0%	3.4	12	10	7	7
Sevier County	15,431	18,842	3,411	22.1%	2.0	14	13	17	17
Wayne County	2,177	2,509	332	15.3%	1.4	26	25	21	21

Sources:
1) http://www.governor.state.ut.us/dea/rankings/county/00county.pdf;
2) U.S. Bureau of the Census; Utah Population Estimates Committee.

Notes:
1) AARC is average annual rate of change.

Table 17: STATE OF UTAH POPULATION
By County and Multi-County District
1980-2030

MCD/ County	1980	1990	2000	2005	2010	2015	2020	2030	AARC 2000-2030
CENTRAL	47,087	52,294	66,192	71,500	77,256	84,409	90,388	94,874	1.21%
Juab County	5,530	5,817	8,238	9,577	10,954	12,552	13,996	15,660	2.16%
Millard County	8,970	11,333	12,405	13,051	13,538	14,250	14,730	14,605	0.55%
Piute County	1,329	1,277	1,435	1,448	1,508	1,570	1,606	1,588,	0.34%
Sanpete County	14,620	16,259	22,763	24,488	26,351	28,685	30,611	31,860	1.13%
Sevier County	14,727	15,431	18,842	20,117	21,649	23,570	25,159	26,174	1.10%
Wayne County	1,911	2,177	2,509	2,819	3,256	3,782	4,286	4,987	2.32%

Sources:
1) http://www.governor.state.ut.us/projections/EDPT3.pdf;
2) U.S. Bureau of the Census; Utah Population Estimates Committee;
3) 2002 Baseline Projections, Governor's Office of Planning and Budget, UPED Model System.

Notes:
1) AARC is average annual rate of change.
2) 1980 and 1990 populations are April 1 U.S. Census modified age, race and sex (MARS) populations;
3) 2000 populations are April 1 U.S. Census summary file 1 (SF1) populations; all others are July 1 populations.

Table 18: STATE OF UTAH HOUSEHOLDS
By County and Multi-County District
1980-2030

MCD/ County	1980	1990	2000	2005	2010	2015	2020	2030	AARC 2000-2030
CENTRAL	14,526	16,237	20,323	22,553	24,987	27,568	29,931	32,505	1.58%
Juab County	1,707	1,870	2,456	2,942	3,482	4,098	4,670	5,447	2.69%
Millard County	2,728	3,390	3,840	4,152	4,513	4,844	5,103	5,229	1.03%
Piute County	435	450	509	516	544	567	588	583	0.45%
Sanpete County	4,454	4,916	6,547	7,254	7,901	8,592	9,230	9,878	1.38%
Sevier County	4,587	4,911	6,081	6,676	7,364	8,096	8,784	9,528	1.51%
Wayne County	615	700	890	1,013	1,177	1,371	1,556	1,840	2.45%

Sources:
1) http://www.governor.state.ut.us/projections/EDPT3.pdf;
2) U.S. Bureau of the Census; 2002 Baseline Projections, Governor's Office of Planning and Budget, UPED Model System.

Notes:
1) AARC is average annual rate of change.
2) 1980, 1990 and 2000 households are April 1 U.S. Census households; all others are July 1 households.

Table 19: STATE OF UTAH POPULATION
Percent of State Total
By County and Multi-County District
1980-2030

MCD/ County	1980	1990	2000	2005	2010	2015	2020	2030	AARC 2000-2030
CENTRAL	3.22%	3.04%	2.96%	2.90%	2.77%	2.70%	2.68%	2.52%	-0.55%
Juab County	0.38%	0.34%	0.37%	0.39%	0.39%	0.40%	0.42%	0.42%	0.39%
Millard County	0.61%	0.66%	0.56%	0.53%	0.49%	0.46%	0.44%	0.39%	-1.20%
Piute County	0.09%	0.07%	0.06%	0.06%	0.05%	0.05%	0.05%	0.04%	-1.40%
Sanpete County	1.00%	0.94%	1.02%	0.99%	0.95%	0.92%	0.91%	0.84%	-0.62%
Sevier County	1.01%	0.90%	0.84%	0.82%	0.78%	0.75%	0.75%	0.69%	-0.65%
Wayne County	0.13%	0.13%	0.11%	0.11%	0.12%	0.12%	0.13%	0.13%	0.54%

Sources:
1) http://www.governor.state.ut.us/projections/EDPT3.pdf;
2) U.S. Bureau of the Census; Utah Population Estimates Committee;
3) 2002 Baseline Projections, Governor's Office of Planning and Budget, UPED Model System.

Notes:
1) AARC is average annual rate of change.
2) 1980, 1990 and 2000 households are April 1 U.S. Census households; all others are July 1 households.

Table 20: STATE OF UTAH HOUSEHOLDS
Percent of State Total
By County and Multi-County District
1980-2030

MCD/ County	1980	1990	2000	2005	2010	2015	2020	2030	AARC 2000-2030
CENTRAL	3.24%	3.02%	2.90%	2.84%	2.73%	2.65%	2.62%	2.46%	-0.55%
Juab County	0.38%	0.35%	0.35%	0.37%	0.38%	0.39%	0.41%	0.41%	0.54%
Millard County	0.61%	0.63%	0.55%	0.52%	0.49%	0.47%	0.45%	0.40%	-1.08%
Piute County	0.10%	0.08%	0.07%	0.07%	0.06%	0.05%	0.05%	0.04%	-1.65%
Sanpete County	0.99%	0.92%	0.93%	0.92%	0.86%	0.83%	0.81%	0.75%	-0.74%
Sevier County	1.02%	0.91%	0.87%	0.84%	0.81%	0.78%	0.77%	0.72%	-0.62%
Wayne County	0.14%	0.13%	0.13%	0.13%	0.13%	0.13%	0.14%	0.14%	0.31%

Sources:
1) http://www.governor.state.ut.us/projections/EDPT3.pdf;
2) U.S. Bureau of the Census;
3) 2002 Baseline Projections, Governor's Office of Planning and Budget, UPED Model System.

Notes:
1) AARC is average annual rate of change.
2) 1980, 1990 and 2000 households are April 1 U.S. Census households; all others are July 1 households.

Table 21: STATE OF UTAH AVERAGE HOUSEHOLD SIZE
By County and Multi-County District
1980-2030

MCD/ County	1980	1990	2000	2005	2010	2015	2020	2030	AARC 2000-2030
CENTRAL	3.19	3.17	3.15	3.07	3.00	2.98	2.94	2.83	-0.36%
Juab County	3.21	3.06	3.31	3.22	3.11	3.03	2.96	2.84	-0.52%
Millard County	3.28	3.32	3.19	3.10	2.96	2.90	2.85	2.75	-0.49%
Piute County	306	2.84	2.79	2.78	2.75	2.75	2.71	2.70	-0.10%
Sanpete County	3.17	3.20	3.27	3.18	3.15	3.16	3.14	3.05	-0.23%
Sevier County	3.19	3.11	3.03	2.95	2.88	2.85	2.81	2.69	-0.39%
Wayne County	3.11	3.07	2.81	2.77	2.76	2.75	2.75	2.70	-0.13%

Sources:
1) http://www.governor.state.ut.us/projections/EDPT3.pdf;
2) U.S. Bureau of the Census; 2002 Baseline Projections, Governor's Office of Planning and Budget, UPED Model System.

Notes:
1) AARC is average annual rate of change.
2) 1980, 1990 and 2000 household sizes are April 1 U.S. Census households; all others are July 1 household sizes.

Economy

EMPLOYMENT

Employment statistics play a vital roll in mitigation, as percentages of small businesses that never re-open following a large disaster are quite high. In addition knowing which sectors of the economy employ a large number of people and were those sectors are physically located factors into the development of mitigation strategies. Preventing damage insures employers will reopen lessening the lasting effect of a large event. Detailed information on other regional economic statistics and land use is found in *Appendix L*.

Physiography, Climate, Geology, and Hazards

For the purpose of geologic, climatic and physiographic descriptions within Six County the following narratives will follow river basins rather than political subdivisions or municipal boundaries. Six County falls within three river basins the West Colorado River Basin, Sevier River Basin, and West Desert Basin.

Physiography

West Colorado River Basin
Wayne County falls almost entirely within the West Colorado River Basin, which is entirely within the Colorado Plateau Physiographic Province. Located within Wayne County are the Dirty Devil, Fremont, and Green Rivers along with the confluence of the Green and Colorado Rivers along its eastern boundary. The Colorado Plateau Physiographic Province is best characterized by high relief between the many tablelands or plateaus and intervening stream cut valleys with deep, steep-sided canyons. Elevations within the Wayne County portion of the Colorado Plateau exceed 11,000 in both the Thousand Lake Mountains and Boulder Mountains.

Sevier River Basin
The majority of the Six County region is within the Sevier River Basin. This basin is part of the landlocked Great Basin Region drains which the Sevier River proper, the Fillmore-Kanosh area, often called the Pahvant Valley, and Beaver River drainage. The Sevier River drainage is separated from the ocean by prominent mountain ranges and geologic features on all four sides. The basin is bounded by the Pink Cliffs, of the Grand Stair Case, Wasatch Plateau, Tintic Mountains, Sheeprock Mountains, Tushar Mountains, Markagunt Plateau, and Pahvant Range.

The topography is diverse, with irrigated valleys between 4,600 and 7,000 feet above sea level. The highest point in the basin being Delano Peak which crowns the Tushar Mountains at 12,173 feet. 12 additional peaks within the basin rise over 11,000 feet.

Within the mixed physiography, each plateau and mountain range has its own character, influencing soils as well as surface and groundwater hydrology. Past erosion and deposition cycles have left piedmont benches and terraces, and produced spectacular scenery.

West Desert Basin

The western half of Juab and Millard Counties fall within the West Desert Basin. This basin lies within the Great Basin Physiographic province and has no external drainage. The basin consists mainly of broad arid alleviated valleys bounded by a series of mountainous regions. Mountain Ranges within the basin run north and south with peaks reaching over 10,000 feet. Contained within the SCAOG portion of the West Desert Basin are the Fish Springs Range, Confusion Range, and the Deep Creek Mountains.

Climate

West Colorado River Basin

Precipitation in the area is influenced by two major storm patterns: one, frontal systems from the Pacific Northwest during winter and spring; the other late summer and early fall thunderstorms from the south and southwest. The southern Utah Low, a high altitude low-pressure system often covering parts of the several states, causes widespread precipitation between the winter frontal systems and summer thunderstorms.

The precipitation ranges from over 30 inches on the Wasatch and Fish Lake plateaus to less than eight inches in the desert areas of the central and southern parts of the basin. Annual water surface pan evaporation varies from about 45 inches at Loa to 58 inches at Hite Marina on Lake Powell. Possible sunshine varies from 85 percent during the summer to 45 percent during the winter. Prevailing winds are generally from the southwest at four to six miles per hour, with maximum wind movement generally occurring during May.

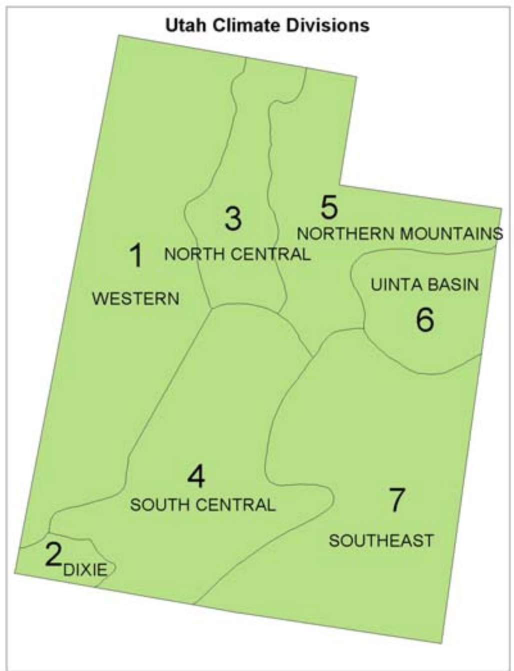


Figure 2

Sevier River Basin

The climate of the Sevier River Basin reflects its location in the transition zone from the Basin and Range Physiographic Province to the Rocky Mountain Colorado Plateau Provinces. The high mountain valleys in the upper drainage areas blend into the semi-arid climate common to the southwest deserts. The northern part of the basin reflects different storm patterns than the southern part.

Mean annual temperatures vary from a high of 50.9 F at Fillmore to a low of 43.9 F at Koosharem. The record high temperature is 110 F at Delta and the record low is –40 F at Scipio.

Precipitation is influenced by two major storm patterns: one, frontal systems from the Pacific Northwest during the winter and spring; the other, late summer and early fall thunderstorms from the south and southwest. Topographic aspects further influence weather systems.

Mean annual valley precipitation varies from a high of 16.00 inches at Fillmore to a low of 8.11 inches at Delta. Basin wide precipitation varies from more than 35 inches in the highest mountains to less than 8 inches in the Sevier Desert. Precipitation extremes include a daily valley rainfall of 2.61 inches at Circleville and a record daily snowfall of 33.3 inches at Gunnison.

West Desert Basin
The climate of the West Desert Basin is typical of mountain-desert areas in the west with wide ranges in temperature between summer and winter, and between day and night. The high mountain regions experience long, cold winters, and short, cool summers. The lower valleys experience greater seasonal fluctuations with temperatures ranging from recorded extremes of -40° F at Ibapah in the winter to over 110° F in arid valleys during the summer. Daily temperature fluctuations can be dramatic; it is not uncommon to have temperature swings of over 40 degrees during any season.

The West Desert Basin lies within the rain shadow of the Sierra Nevada Mountains and except for the high mountaintops; the lands within the basin are classified as arid or semi-arid. June to September is the driest part of the year with precipitation at its lowest and evapo-transpiration rates at there highest. Little benefit is obtained from summer rains which are either too light to soak the soil, or come as cloudbursts, resulting in rapid run-off and consequently providing little soil moisture.

Geology

West Colorado River Basin
Within this basin, each plateau, mountain and canyon has its own character, which influences soil forming processes and the surface and groundwater hydrology. Past erosion and deposition cycles have left pediment slopes and terraces. Rocks from all eras of geologic time are found here with large areas being covered by sedimentary rocks of Mesozoic age. Included in this group is the Navajo Sandstone, which is an important source of groundwater. Igneous rock is found on many of the basins mountain ranges. In many places they occur as Tertiary age extrusive basalt, andesite, and latite lava flows and dacitic to rhyolitic ash flow tuffs. Unconsolidated eolian and alluvial deposits cover small areas.

While the Colorado Plateau is characteristically aseismic and lacks the large faults found in the transition zone to the west, the rocks in this basin have suffered much structural deformation. Powerful forces at work in the crust of this area have resulted in the formation of large folds, anticlines, synclines, and monoclines. These features have a tremendous influence on the occurrence and movement of surface water and groundwater. Some of these features include the Waterpocket Fold, the Cockscomb Ridge, Caineville Monocline, and the Saleratus Creek Syncline.

Sevier River Basin
Rocks from all eras of geologic time are represented, but either Tertiary volcanic or Jurassic, Cretaceous, Tertiary or Quaternary sediments cover most of the area. Quaternary basalts are found on the Markagunt and Paunsaugunt plateaus and in the Sevier Desert.

Two major faults trend northeasterly through the area. The Paunsaugant fault runs from northern Arizona, past Bryce Canyon, through Grass Valley. The Sevier fault runs from near Pipe Springs in northern Arizona, through the eastern side of Sevier Valley, and into Sanpete Valley to the Cedar Hills. A third fault, the Elsinore fault, although smaller is one of the most active faults in Utah.

West Desert Basin
Mountain blocks are composed mostly of rocks or Paleozoic and Precambrian age. These hard, brittle rocks are permeable when fractured, and can provide groundwater aquifers. The Paleozoic formations include several limestone and dolomite units, which constitute an important regional aquifer system. The centers of the valleys and basins are typically underlain with lacustrine silts and clay, which have low permeability, and contain water with high dissolved solids. The alluvial slopes fringing the mountain blocks are composed of more permeable sand and gravel, and form important local aquifers.

Hazards
Natural hazards differ throughout the state and throughout the SCAOG study area, based on variables such as underlying geology, topography, hydrology, development patterns, and climate. For this reason a risk assessment was conducted by the Six County Association of Governments to determine what natural hazards might affect the Pre-Disaster Mitigation planning. The first step in risk assessment is identifying the hazards that could affect the region. Hazard identification addresses the geographic extent and intensity / magnitude of a hazard as well as the probability of its occurrence. Hazard identification was initiated through an extensive process that utilized the following:

- Core Planning Team
- Local Planning Team
- Technical Team
- Community and Public individuals
- Elected Officials
- City and County Agencies
- Utah Department of Emergency Services and Homeland Security
- Utah Geological Survey
- Utah Automated Geographic Reference Center

The natural hazards in the table below have the possibility of affecting each county within the SCAOG region. The identification process for each county and participating jurisdictions utilized those natural hazards, which consistently affected each county prior to and during the planning process based on history of occurrences, future probability, and risk. Table 22 identifies those hazards on a county level for easy reference.

The SCAOG in conjunction with DES and local officials created maps, which identified municipalities affected by each identified hazards. Initial data from this study was also used to determine those hazards that presented the greatest risk to each of the counties. The geographic extent is identified in the maps at the end of every county section. The hazard intensity/ magnitude and probability is also profiled in each county section.

Within each of the six counties, there are a total of 48 jurisdictions. All of these jurisdictions contributed to the risk assessment analyses performed for each county when located within a hazard boundary. Within each county section refer to the "description and location of extent" paragraph detailing this risk assessment.

Table 22 shows the results of their risk assessment and how and why each hazard with the potential of affecting areas within the Six County Association of Governments was identified. Table 23 shows the composite natural hazard frequencies and recurrence intervals. In the annexes of this plan identified hazards are planned for on a county-by-county basis, with the exception of drought and severe weather. While all hazards don't stop at county boundaries politics dictated this planning process, as did the availability of GIS data.

Table 22: Natural Hazard Identification

Hazard	How Identified	Why Identified
Dam Failure	• Review of County Emergency Operations Plans • Assistance from Utah Division of Water Rights, Dam Safety Section • Community's profile	• Can cause serious damage to life and property and have subsequent effects such as flooding, fire, debris flow, etc.
Drought	• Review of County Emergency Operations Plans • Community's profile • National Climate Data Center • Palmer Drought Severity Index readings	• Affects local economy, water reservoirs, soil • Previous experiences
Earthquake	• Review of County Emergency Operations Plans • Input from City and County Emergency Operations Managers • United States Geological Survey • Utah Geological Survey • HAZUS analysis	• Utah is predicted, 1/5 chance, to experience a large earthquake within the next fifty years. • Numerous faults throughout Utah • Utah experiences approximately 13 earthquakes a year with a magnitude over 3.0. • Can create fire, flooding, hazardous materials incident, transportation and communication limitations
Flooding	• Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers • Utah Division of Water Resources • Utah Geological Survey • Flood Insurance Studies • Army Corps of Engineers • Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers • Utah Division of Water Resources • Utah Geological Survey • Army Corps of Engineers	• Associated with drought and dry soils that the State is frequented with • Several previous incidents have caused severe damage and loss of life • Many of the rivers and streams are located near neighborhoods • Many neighborhoods are located on floodplains, alluvial fans • Associated with drought and dry soils that the State is frequented with • Previous incidents have caused severe damage and loss of life • Many neighborhoods are located near canyon mouths and on floodplains
Infestation	• Review of County Emergency Operations Plans • Input from County Emergency Managers	• Affects local economy and vegetation
Slope Failure (landslide, debris flow and slide)	• Review of County Emergency Operations Plans • Utah Geological Survey • Input from County Emergency Managers • Community's profile • Community's profile • National Climate Data Center • GIS analysis • Past State Mitigation Plans	• Past incidents have caused loss of life property damage, disruption of power lines and communication • Have caused damage in the past

Hazard	How Identified	Why Identified
Problem Soils	• Review of County Emergency Operations Plans • Utah Geological Survey • GIS analysis • Past onsite investigations by Inter-Agency Technical Team.	• Related to subsequent effects from earthquakes that happen regularly • Affect infrastructure
Sever Weather (Winter storms, Avalanches, tornados, lightening)	• Review of County Emergency Operations Plans • Community's profile • Review of County Emergency Operations Plans • Review of past disaster declarations • Input from City and County Emergency Operations Managers • Utah Avalanche Forecast Center • Utah Department of Transportation • Review of County Emergency Operations Plans • National Climate Data Center • National Weather Service Special Publication	• Communities, homes, infrastructure, roads, ski areas, and people can be affected by an Avalanche • Avalanches have caused property damage and loss of life in the past • Have caused property damage and loss of life
Urban Fire	• Review of County Emergency Operations Plans • Input from County Emergency Managers	• Serious threat to property and life • Associated with flooding, earthquake
Wildland Fire	• Past Wildfire Occurrences • Review of County Emergency Operations Plans	• Potential structure damage • Watershed damage

Table 23: Composite Natural Hazard Frequencies and Recurrence Intervals For Six County Association of Governments

Hazard	Number of Events	Year in Record	Recurrence Interval (years)	Hazard Frequency (% chance/year)
Wildfire	1540	17	.011	9,058.8
Wildfire greater than 100 acres	150	17	.113	882.3
Tornados	22	52	2.36	42.3
Drought	35	107	3.05	32.7
Dam Failure	1	103	103	0.9
Lightning	7 deaths	53	7.6	13.2

Building Code Effectiveness Grading BCEGS Scores:

The Insurance Services Office, Inc performs building Code Effectiveness Grading Reports (BCEGS). Table 24 shows the BCEGS Scores for communities in the Six County Region. The program implemented in 1995 assesses the building codes in effect in a particular community and how well the community enforces it building codes. The BCEGS program assigns each municipality a BCEGS grade of 1 to 10 with one showing exemplary commitment to building code enforcement. Insurance Services Inc. (ISO) developed advisory rating credits that apply to ranges of BCEGS classifications 1-3, 4-7, 8-9, 10. ISO gives insurers BCEGS classifications, BCEGS advisory Credits, and related underwriting information. The concept is that communities with effective, well-enforced building codes should sustain less damage in the event of a natural disaster, and insurance rates can reflect that. The prospect of lessening natural hazard related damage and ultimately lowering insurance costs provides and incentive for communities to enforce their building codes rigorously.

Table 24: BCEGS

Community	County	Commercial Score	Residential Score	Date Completed
Eureka	Juab	4	4	2000
Nephi	Juab	6	6	2001
Fillmore	Millard	4	4	2000
Millard County	Millard	4	4	1997
Sanpete County	Sanpete	4	4	2001
Sevier County	Sevier	3	3	2001

Part IV. Plan Maintenance Procedures

Monitoring, Evaluating and Updating the Plan

Periodic monitoring and reporting of the Plan is required to ensure that the goals and objectives for the Six County Region are kept current and that local mitigation efforts are being carried out. The Plan has therefore been designed to be user-friendly in terms of monitoring implementation and preparing regular progress reports.

Annual Reporting Procedures

The Plan shall be reviewed annually, as required by the SCAOG Executive Board, or as situations dictate such as following a disaster declaration. Each year the SCAOG Planning and Community Development Department Staff will review the plan and ensure the following:

1. The Executive Director and the SCAOG Executive Board will receive an annual report and/or presentation on the implementation status of the Plan at the January Executive Board Meeting which is open to the public.

2. The report will include an evaluation of the effectiveness and appropriateness of the mitigation actions proposed in the Plan.

3. The report will recommend, as appropriate, any required changes or amendments to the Plan.

If the SCAOG Executive Board determines that a modification of the Plan is warranted, the Board may initiate a Plan amendment.

Revisions and Updates

Periodic revisions and updates of the Plan are required to ensure that the goals and objectives for the Six County Region are kept current. More importantly, revisions may be necessary to ensure the Plan is in full compliance with Federal regulations and State statutes. This portion of the Plan outlines the procedures for completing such revisions and updates.

Five (5) Year Plan Review

Based on funding, the entire plan including any background studies and analysis should be reviewed every five (5) years to determine if there have been any significant changes in the Six County Region that would affect the Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques and changes to Federal or State legislation are examples of changes that may affect the condition of the Plan. The local elected officials in the Six County area will be consulted in the five (5) year review/update process. Typically, the same process that was used to create the original plan will be used to prepare the update. Each community will hold public meetings to gain input on how the plan should be updated. The requirements of the mitigation plan will be incorporated into the Six County AOG Consolidated Plan including FEMA mitigation projects as part of the Six County Capital Improvements List.

Further, following a disaster declaration, the Plan will need to be revised to reflect on lessons learned or to address specific circumstances arising out of the disaster.

The results of this five (5) year review should become summarized in the annual report prepared for this Plan under the direction of the Planning and Community Development Director. The annual report will include an evaluation of the effectiveness and appropriateness of the Plan, and will recommend, as appropriate, any required changes or amendments to the Plan.

If the SCAOG Executive Board, local jurisdiction, Division of Emergency Services, or FEMA determines that the recommendations warrant modification to the Plan, the Board may either initiate a Plan amendment as described below, or, if conditions justify, may direct the SCAOG Planning and Community Development Department to undertake a complete update of the Plan.

Plan Amendments

An amendment to the Plan should be initiated only by the SCAOG Executive Board, either at its own initiative or upon the recommendation of the Executive Director, Planning and Community Development Director or Mayor of an affected community.

Upon initiation of an amendment to the Plan, SCAOG will forward information on the proposed amendment to all interested parties including, but not limited to, all affected city or county departments, residents and businesses. At a minimum, the information will be made available through public notice in a newspaper of general circulation and on the SCAOG Website at http://www.sixcounty.com/. Information will also be forwarded to the Utah Department of Public Safety, Division of Emergency Services and Homeland Security. This information will be sent out in order to seek input on the proposed Plan amendment for not less than a forty-five (45) day review and comment period.

At the end of the comment period, the proposed amendment and all review comments will be forwarded to the Executive Director or designee for consideration. If no comments are received from the reviewing parties within the specified review period, such will be noted accordingly. The Executive Director or designee will review the proposed amendment along with comments received from other parties and submit a recommendation to the SCAOG Executive Board within sixty (60) days.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered:

1. There are errors or omissions made in the identification of issues or needs during the preparation of the Plan; and/or
2. New issues or needs have been identified which were not adequately addressed in the Plan; and/or
3. There has been a change in information, data or assumptions from those on which the Plan was based.

4. The nature or magnitude of risks has changed.

5. There are implementation problems, such as technical, political, legal or coordination issues with other agencies.

Upon receiving the recommendation of the Executive Director or designee, the SCAOG Executive Board will hold a public hearing. The SCAOG Executive Board will review the recommendation (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the SCAOG Executive Board will take one of the following actions:

1. Adopt the proposed amendment as presented.

2. Adopt the proposed amendment with modifications.

3. Refer the amendment request back to the Executive Director for further consideration.

4. Defer the amendment request for further consideration and/or hearing.

5. Reject the amendment request.

Implementation through Existing Programs

Implementation
Each jurisdiction included in the Six County Association of Governments Pre-Disaster Hazard Mitigation Plan has a current Capital Improvements Plan (CIP). The Capital Improvement Planning that occurs in the future will contribute and be a reflection of the goals in the Hazard Mitigation Plan. It will be the responsibility of Mayor/Council/Commissioner(s) of each jurisdiction, as he/she/they see fit, to include within the Capital Improvements Plan action items that have been outlined within the Mitigation Plan and ensure these actions are carried out no later than the target dates unless reasonable circumstances prevent their implementation (i.e. lack of funding availability).

Many mitigation strategies can be implemented through existing federal, state, and county programs and administered by the county emergency manager. Examples include the National Flood Insurance Program, Fire Wise, Living with Fire Committee, and Storm Ready. County Emergency Managers are constantly looking to implement low or no cost mitigation measures.

Prioritization
For this plan projects were prioritized using that STAPLEE method and given a rating of high, medium or low. These rating take into account the following evaluation criteria: social, technical, administrative, political, legal, and funding. Emphasis was given to funding which is a fundamental consideration in any hazard mitigation project. Benefit cost analysis was not formally conducted on any of the projects suggested in the mitigation strategies. With few exceptions, none of the projects in the plan were

developed far enough to derive a meaningful benefit to cost ratio. Should funding become available the extent by which benefits are maximized with regard to cost, would play a significant roll in determining which, projects get funded and which do not.

Administrative

Project administration is purely a function of project size and complexity, for given jurisdictions within the planning area. Jurisdictions have self-funded or received state and federal funding for numerous projects in the past. The larger the project the more administration resources are needed. Local jurisdictions with current staff could administer small projects or request county or state assistance. Larger projects would most likely still by managed "in-house" but would require additional staff be hired and may request state technical assistance.

Funding Sources

Although all mitigation techniques will likely save money by avoiding losses, many projects are costly to implement. The Six County jurisdictions will continue to seek outside funding assistance for mitigation projects in both the pre- and post-disaster environment. This portion of the Plan identifies the primary Federal and State grant programs for Six County jurisdictions to consider, and also briefly discusses local and non-governmental funding sources.

Federal

The following federal grant programs have been identified as funding sources which specifically target hazard mitigation projects:

Title: Pre-Disaster Mitigation Program
Agency: Federal Emergency Management Agency
Through the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential Disaster Declaration. The Pre-Disaster Mitigation (PDM) program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage and destruction of property.

The funding is based upon a 75% Federal share and 25% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination. Special accommodations will be made for "small and impoverished communities", who will be eligible for 90% Federal share/10% non-Federal.

FEMA provides PDM grants to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities:

- State and local hazard mitigation planning
- Technical assistance (e.g. risk assessments, project development)
- Mitigation Projects
- Acquisition or relocation of vulnerable properties
- Hazard retrofits
- Minor structural hazard control or protection projects

- Community outreach and education (up to 10% of State allocation)

Flood Mitigation Assistance Program
Agency: Federal Emergency Management Agency

FEMA's Flood Mitigation Assistance program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 USC 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program, and is available to states on an annual basis. This funding is available for mitigation planning and implementation of mitigation measures only, and is based upon a 75% Federal share/25% non-Federal share. States administer the FMA program and are responsible for selecting projects for funding from the applications submitted by all communities within the state. The state then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Hazard Mitigation Grant Program
Agency: Federal Emergency Management Agency

The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistant Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration.

To meet these objectives, FEMA can fund up to 75% of the eligible costs of each project. The state or local cost-share match does not need to be cash; in-kind services or materials may also be used. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993, federal funding under the HMGP is now based on 15% of the federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster.

The HMGP can be used to fund projects to protect either public or private property, so long as the projects in question fit within the state and local governments overall mitigation strategy for the disaster area, and comply with program guidelines. Examples of projects that may be funded include the acquisition or relocation of structures from hazard-prone areas, the retrofitting of existing structures to protect them from future damages; and the development of state or local standards designed to protect buildings from future damages.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. These organizations must apply for HMPG project funding on behalf of their citizens. In turn, applicants must work through their state, since the state is responsible for setting priorities for funding and administering the program.

Public Assistance (Infrastructure) Program, Section 406
Agency: Federal Emergency Management Agency

FEMA's Public Assistance Program, through Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, provides funding to local governments following a Presidential Disaster Declaration for mitigation measures in conjunction with the repair of damaged public facilities and infrastructure. The mitigation measures must be related to eligible disaster related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. These opportunities usually present themselves during the repair/replacement efforts.

Proposed projects must be approved by FEMA prior to funding. They will be evaluated for cost effectiveness, technical feasibility and compliance with statutory, regulatory and executive order requirements. In addition, the evaluation must ensure that the mitigation measures do not negatively impact a facility's operation or risk from another hazard.

Public facilities are operated by state and local governments, Indian tribes or authorized tribal organizations and include:

- Roads, bridges & culverts
- Draining & irrigation channels
- Schools, city halls & other buildings
- Water, power & sanitary systems
- Airports & parks

Private nonprofit organizations are groups that own or operate facilities that provide services otherwise performed by a government agency and include, but are not limited to the following:

- Universities and other schools
- Hospitals & clinics
- Volunteer fire & ambulance
- Power cooperatives & other utilities
- Custodial care & retirement facilities
- Museums & community centers

SBA Disaster Assistance Program
Agency: US Small Business Administration

The SBA Disaster Assistance Program provides low-interest loans to businesses following a Presidential disaster declaration. The loans target businesses to repair or replace uninsured disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible, along with non-profit organizations.

Their recipients to incorporate mitigation techniques into the repair and restoration of their business can utilize SBA loans.

Community Development Block Grants
Agency: US Department of Housing and Urban Development

The Community Development Block Grant (CDBG) program provides grants to local governments for community and economic development projects that primarily benefit low- and moderate-income people. The CDBG program also provides grants for post-disaster hazard mitigation and recovery following a Presidential disaster declaration. Funds can be used for activities such as acquisition, rehabilitation or reconstruction of damaged properties and facilities and for the redevelopment of disaster areas.

State Programs
The state of Utah maintains a philosophy of local responsibility for hazard mitigation. State agencies still provide an integrated network of support, services, and resources for hazard mitigation activities. As demonstrated during past disasters, these agencies are well organized in their delivery and coordination of services. The following is a review of State departments with disaster responsibilities describing their existing and planned mitigation programs.

An evaluation of the laws, regulations, authorities, policies, and programs used in Utah to mitigate hazards demonstrate that they work exceptionally well, as evidenced by the massive amount of mitigation accomplished in Utah, the few numbers of disasters, and the limited nature of those emergencies that do occur. According to the Utah SHMT, the only changes that could be considered by the Legislature might be ones that parallel the Federal Disaster Mitigation Act of 2000, which would integrate pre-disaster mitigation considerations into the code of various state agencies.

Utah Division of Emergency Services and Homeland Security (DESHS)

The capabilities of DESHS Hazard Mitigation Program include:

- Prepare, implement, and maintain programs and plans to provide for preventions and minimization of injury and damage caused by disasters.
- Identify areas particularly vulnerable to disasters.
- Coordinate hazard mitigation and other preventive and preparedness measures designed to eliminate or reduce disasters.
- Assist local officials in designing local emergency actions plans.
- Coordinate federal, state, and local emergency activities.
- Coordinate emergency operations plans with emergency plans of the federal government.

Through the State Hazard Mitigation Program, the following occurs:
- Provide a state coordinator for hazard mitigation, the State Hazard Mitigation Officer.
- Provide a central location of the coordination of state hazard mitigation activities.

- Provide coordination for the Federal Pre-Disaster Mitigation Program.
- Provide for coordination of Project Impact.
- Provide coordination for Comprehensive Multi-hazard Mitigation Plan development, implementation, and monitoring.
- Provide for interagency coordination
- Provide development of procedures for grant administration and project evaluation.
- Provide State Hazard Mitigation Team assistance to local governments.
- Provide for development of specific hazard mitigation plans, such as drought and wildfire.
- Provide for local hazard and risk analysis.
- Provide for development of SHMT mitigation recommendations following disasters.

Utah Department of Agriculture

The Utah Department of Agriculture administers programs serving the state's large agricultural sector. The department's response role during and after a disaster period has been to coordinate damage reports for funding needs and provides loan and recovery program information and assistance to disaster victims. This service is provided for flood, drought, insect infestation, fire, livestock disease, and frost.

Assistance during Drought Disasters
A damage reporting network coordinated through the existing County Emergency Boards was established during the drought disaster of 1996. Each county agent assembled damage reports in his area and transmitted them through a computer network based at Utah State University. The individual damage reports from each county were recapped in the Department of Agriculture and formed the basis of documentation for an appeal to the legislature for additional funds to mitigate the damage.

Loans Handbook
The department has prepared a handbook listing the types of loans available for flood damage to agriculture, the funding requirements, and applications procedures. This includes loans from both state and federal sources. There are three loan programs operated by the agriculture department, all of which can be used for flood damage:

1) Rural Rehabilitation Loan Program (federally funded and operated by the state)
2) Agriculture Resource Development Loan Program (state funded)
3) Emergency Loan Program (state funded)

Soil Conservation Program
The Department of Agriculture also administers the ongoing Soil Conservation Program. In each of the state's thirty-nine soil conservation districts, three unpaid, elected supervisors offer technical assistance and consultation on watershed protection. The state offers limited technical and planning assistance through a staff member. The program works cooperatively with the federal Soil Conservation Service, which provides most of the technical assistance. The ongoing program is not regulatory, but is directed towards improved water use and soil conservation.

Disaster Easements
Because of the similarity between past events, the department is now working on a permanent hazard mitigation concept known as "Disaster Easements", which may have widespread agreements with irrigation companies, water districts, or water users' associations for the purpose of routing flood water through local communities.

Monitoring Ground Water Quality
The Department also monitors the quality of groundwater, including individual wells and springs throughout the State.

Non-Point Source Pollution
The Department's Non-Point Source Pollution Program focuses on flood prevention through reduction of erosion, vegetating streams, and restoring "natural stream structure". The Department also monitors drought conditions, which are a precursor to wildfire.

Department of Community and Economic Development

Permanent Community Impact Fund Board
The Permanent Community Impact Fund Board provides loans and/or grants to state agencies and subdivisions of the state, which are or may be socially or economically impacted, directly or indirectly, by mineral resource development on federal lands.

Under the Federal Mineral Lease Act of 1920, leaseholders on public land make royalty payments to the federal government for the development and production of non-metalliferous minerals. In Utah, the primary source of these royalties is the commercial production of fossil fuels on federal land held by the U.S. Forest Service and the Bureau of Land Management. Since the enactment of the Minerals Lease Act of 1920, a portion of these royalty payments, called mineral lease payments, have been returned to the state in an effort to help mitigate the local impact of energy and mineral developments on federal lands.

Funding Options
The Board has the option of funding projects with loans and/or grants. The Board's preferred financing mechanism is an interest-bearing loan.

Loan Requirements
In providing financial assistance in the form of a loan, the Board may purchase an applicant's bonds only if the bonds are accompanied by legal opinion of recognized municipal bond counsel to the effect that the bonds are legal and binding under applicable Utah Law.

The Board may purchase either a taxable or tax-exempt bond. The board may purchase taxable bonds if it determines, after evaluating all relevant circumstances, including the applicant's ability to pay, that the purchase of the taxable bonds is in the best interest of the state and the applicant.

Grants
Grants may be provided only when the other financing mechanisms cannot be utilized, where no reasonable method of repayment can be identified, or in emergency situations regarding public health and/or safety.

Community Development Block Grant
The Community Development Block Grant, or CDBG program, provides funding from the federal government's Department of Housing and Urban Development or HUD, to small cities and counties in the State of Utah.

Utah Division of State History

The Utah State Historical Society, Utah's Division of State History, was founded in 1897 on the 50th anniversary of the first settlement in the Salt Lake Valley by the Mormon Pioneers. The Society became a state agency in 1917, now housed in the historic Rio Grande Depot since 1980. The Division stimulates archaeological research and study; oversees the protection and orderly development of sites; collects and preserves specimens; administers site surveys; keeps excavation records; encourages and supports the preservation of historic and pre-historic sites and publishes antiquities records. The Division also issues archaeological permits and consults with agencies and individuals doing archaeological work.

Preserving and Sharing Utah's Past
The mission of the State Division of History is "preserving and sharing Utah's past for the present and the future".

State Historical Preservation Officer (SHPO)
The SHPO administers the Section 106 process (national Historic Preservation Act) in Utah. The SHPO also serves on the Utah State Hazard Mitigation Team, providing guidance on historical and cultural preservation regulations.

Historic properties include districts, buildings, structures, objects, landscapes, archeological sites, and traditional cultural properties that are included in, or eligible for inclusion in, the National Register of Historic Places. These properties are not just "old buildings" or "well-known historic sites, but places important in local, state, or national history. Facilities as diverse as bridges and water treatment plants may be considered historic.

Utah Geological Survey (UGS)

The Utah Geologic and Mineral Survey is the principle state agency concerned with geologic hazards. Through years of study, the UGS has developed considerable information on Utah's geologic hazards. When geologic events occur or threaten to occur, the UGS is consulted by other state agencies, local governments, and private organizations for assistance in defining the threat from natural hazards. The UGS works in partnership with other agencies, such as DESHS, in relating the threats from natural hazard to the communities at risk.

Functions
The functions of the UGS include the following:

- Evaluation of individual geological hazards;
- Participation on local government and state agency technical teams;
- Prediction of the performance on individual slides once they began to move;
- Coordination and awareness of research efforts undertaken by other agencies;
- Provide information on status of individual geologic hazards;
- Reconnaissance reports on status of hazards statewide;
- Advise Division of Water Rights on geologic hazards associated with dam sites; and
- Provide geologic information for use during planning of remedial actions.

Laws/authorities/policies of the Utah Geological Survey for conducting mitigation

Utah Code Annotated
Chapter 73 Geological and Mineral Survey
Section 68-73-6 Objectives of Survey
(1) Determine and investigate areas of geologic and topographic hazards that could affect the safety of, or cause economic loss to, the citizens of this state; (f) assist local and state government agencies in their planning, zoning, and building regulations functions by publishing maps, delineating appropriately wide special earthquake risk areas, and, at the request of state agencies, review the citing of critical facilities:

Utah State Office of Education (USOE) Rule R277-455 Standards and Procedures for building plan review

R277-455-4 Criteria for Approval; to receive approval of a proposed building site, the local school district must certify that:

Staff of the Utah Geologic Survey have reviewed and recommended approval of the geologic hazards report provided by the school districts geo-technical consultant.

Division of Water Resources

The Divisions role of planning, funding and constructing water projects serves as both active and passive hazard mitigation against drought and flood situations throughout the state. The various State water plans contain brief summaries of flood threat and risk for each drainage.

The Division is one of seven agencies in the State Department of Natural Resources. The eight member Water Resources Board, appointed by the governor, administers three state water conservation and development funds. These include:

- Revolving Construction fund – This fund started in 1947 with 1 million legislative appropriation to help construct irrigation projects, wells and rural culinary water systems. Further appropriations have added to this fund.

- Conservation and Development Fund – This fund was created in 1978 with the sale of 25 million in general obligations bonds. Money was added to this fund with bond sales in 1980 and 1983. The C & D Fund generally helps sponsors finance larger multi-purpose dams and water systems.
- Cities Water Loan Fund – Established with an initial legislative appropriation of 2 million dollars in 1974, and with continued appropriations, this fund provides financing to help construct new culinary water projects for cities, towns, improvement districts, and special service districts.

Construction Funds
In addition to overseeing these three construction funds, the Division also manages the State funds appropriated each year for renovation and reconstruction of unsafe dams. As the funding arm of the state for water resource projects the Division works closely with Water Rights, the Regulatory arm of the state charged with jurisdiction over all private and state owned dams.

Water Resource Planning
The Division is also charged with the general water resource planning for the state. The State Water Plan is a process that is coordinated to evaluate existing water resources in the state, determine water-related issues that should be confronted and recommend how and by whom issues can be resolved. The plan identifies programs and practices of state and federal agencies, water user groups and environmental interests and describes the state's current, future, and long-term water related needs. The plan is continually updated using current hydrologic databases, river basin simulations, water supply and demand models and water related land use inventories. Revisions reflect the latest water conservation and development options concerning water rights, water transfers, population, zoning, and many other complex issues for the next 50 years in the state's major river basins.

Utah Division of Forestry, Fire, and State Lands

The Division of Forestry, Fire & State Lands utilizes the principles of stewardship and ecosystem management to assist non-federal landowners in management of their natural resources. The agency provides wildland fire protection for non-federal landowners commensurate with risk; and optimizes the benefits from ecosystem based, multiple-use management of resources held in the public trust. Wildfires are managed from six area offices 1) Bear River Office, 2) Northeast Area, 3) Wasatch Front Area, 4) Central Area, 5) Southwest Area, and 5) Southeast Area. The Division operates under the authority of the Utah Code Annotated 65-A-3-1 though 10.

The Flame-n-Go's (pronounced Flamingoes)
In 1978 the Division of Forestry, Fire, and State Lands and the Utah State Prison signed a cooperative agreement establishing Utah's first volunteer, inmate wildland fire hand-crew. The inmates named themselves the "Flame-N-Go's" and designed a logo that has become well known in the wildland fire fighting community.

All Flame-N-Go's are carefully screened for the program. They must complete rigorous training and sign a yearly contract committing themselves to preserving Utah's natural resources and building responsible lives.

The Flame-N-Go's are divided into three crews, each of which can respond to fires anywhere in the United States. A twenty-man type II hand line crew is the backbone of the group, responding to each assignment with all tools and equipment needed to do battle on the fire line. An Engine Strike Team, (five fire engines, outfitted with men and equipment) is ready to respond when needed as an Engine Strike Team or a Type II Hand line Crew. The Hotshot crew is trained to tackle the most dangerous fires in the most rugged terrain. All crews during peak fire season are on 24-hour call to respond within an hour's notice. These crews respond to an average of 50 fires per year and typically spend 45,000 hours fighting fires each season. At least one Division of Forestry, Fire, and State Lands supervisor and two Department of Corrections staff accompany each crew.

Each year, Flame-N-Go's are put through at least 80 hours of extensive training including classroom work and practical field exercises. Safety, individual and team skills, and professionalism are stressed.

National Fire Plan
The Division administers the State responsibilities of the National Fire Plan, a current emphasis of the U.S. Congress, which also addresses hazard and risk analysis and hazard mitigation.

Living with Fire Committee
The Division works in partnership with the U.S. Forest Service, Bureau of Land Management, and various other entities tasked with suppressing wildland fires on the "Living with Fire" program promoting wildland fire mitigation.

Utah Division of State Parks and Recreation

The goal of the Division of Parks and Recreation is to enhance the quality of life for residents and visitors of our state through parks, people, and programs. They are responsible for protecting, preserving, and managing many of Utah's natural and heritage resources.

Hazard and Risk Analyses
The Division develops hazard and risk analyses for the State Parks as part of the park resource management plans. The Utah Division of Emergency Services and Homeland Security produced one analysis for Snow Canyon State Park in Washington County.

Non-Motorized Trail Program
The Recreational Trails Act of 1991 charged Utah State Parks and Recreation with coordinating the development of a statewide network of non-motorized trails. The Non-Motorized Trail program makes state and federal funds available on a 50/50 matching basis to any federal, state, or local government agency, or special improvement district for the planning, acquisition, and development of recreational trails.

Grants from State Parks Boards
The council advises the Division of Parks and Recreation on non-motorized trail matters, reviews requests for matching grant fiscal assistance, rates and ranks proposed trail projects and along with State Park's staff provides recommendations for funding to the State Parks Board.

River Way Enhancement Program
In 1986, the Utah Legislature passed a bill, which established the River Way Enhancement Program. The program makes state funds available on a 50/50 matching basis to state agencies, counties, cities, towns, and/or special improvement districts for property acquisition and/or development for recreation, flood control, conservation, and wildlife management, along rivers and streams that are impacted by high density populations or are prone to flooding. Public outdoor recreation should be the primary focus of the project.

Utah Division of Water Rights

The Division of Water Rights is the state agency that regulated appropriation and distribution of water in the State of Utah. It is an office of public record. The Utah State Engineer's Office was created in 1897. The State Engineer's Office is the chief water rights administrative officer. A complete "water code" was enacted in 1903 and was revised and reenacted in 1919. This law, with succeeding complete reenactments of State statutes, and as amended, is presently in force mostly as *Utah Code, Title 73*. In 1963, the name was changed from State Engineers office to the Division of Water Rights.

All water in Utah is public property. A water right is a right to the use of water based upon 1) quantity, 2) source, 3) priority date, 4) nature of use, 5) point of diversion, and 6) physically putting water to beneficial use.

Dam Regulation
The State engineer has the authority to regulate dams for the purpose of protecting public safety. Dams are classified according to hazard, size, and use. The dam inventory gives the identification, location, construction parameters, and the operation and maintenance history of the dams in Utah.

Stream Alterations Program
The Utah State Engineer's Office administers a Stream alterations program with the purpose of regulation activities affecting the bed or banks of natural streams. The State Engineer's working definition of a natural stream is any natural waterway in the state, which has flows of sufficient duration to develop a characteristic ecosystem distinguishing it from the surrounding environments. Any individual planning an activity that will affect a natural stream must first obtain a Stream Alterations Permit from this office.

Most proposals reviewed by the State, are covered by General Permit 40, which authorizes the state to have its Stream Alteration Permit fulfill the requirements of Section 404 of the Clean Water Act for most activities. General permit 40 does not apply in some instances and a U.S. Army Corps of Engineers Individual Permit is required.

Projects requiring this additional permit include those involving wetlands, threatened or endangered species, properties listed on the National Historic Register, stream relocation, or the pushing of streambed material against a stream bank.

Dam Safety Program

The Dam Safety Section of the Division of Water Rights was established under Chapters 73-5a 101 thru 73-5a 702 including chapters 73-2-22 for Flood Control and the Chapter 63-30-10 Waiver of Immunity of the Utah Code and Rules R655-10 thru R655-12-6A. The program basically has jurisdiction over all private and state owned dams in the state during design, construction, operation, and decommissioning. This involves periodic inspections according to hazard classifications, inventory maintenance, design, and construction approval and systematic upgrade of all the high hazard structures to current dam safety Minimum Standards and creation of Emergency Action Plans for High Hazard dams. Since 1991, detailed dam reviews have been undertaken by the staff and by private consulting firms. Since 1995, the State Legislature has provided 3-4 million dollars per year to finance 50% of the instrumentation, investigations, and design and 80 to 90% of the construction costs of retrofitting and upgrading deficient dams, starting with the worst dams in the most hazardous locations.

The impetus for this dam safety program has been in reaction to dam failures, both in Utah and in other states, including the Teton Dam in Idaho and the Trial Lake Dam in Summit County and the Quail Creek Dam near St. George Utah. Since the establishment of our Minimum Standards program we have fostered the repair of dozens of dams and have not had a catastrophic failure since.

Future recommendations include continuation of the funding for dam upgrades for all the high hazard dams, and then the moderate hazard dams, continued annual inspections for maintenance items and dangerous deficiencies, upgrading EAP, and hazard assessment to reflect downstream development. Inclusion of the scanned design drawings and inundation maps from the EAP studies is being considered for our web page for public information and emergency access. Possible expansion of the program to cover canals and dikes has been considered.

Utah Division of Wildlife Resources

It is the mission of the Utah Division of Wildlife Resources to serve people of Utah as trustee and guardian of the State’s wildlife. The Division Regulates hunting, fishing and trapping, and promotes recreational, educational, scientific and aesthetic enjoyment of wildlife.

Wildlife Habitats and Hazards

Wildlife species and/or their habitats are frequently exposed to hazards. These may be either natural or human influenced (i.e. drought, flood, fire, wind, snow, wetland drainage, water diversions, hazardous material spills, improper/illegal chemical use, earthquake, and other land or water construction/development). Impact resulting either directly or indirectly, from individuals or an accumulation of several hazards, may cause but not be limited to: decreased water supply, stream/lake channel/basin morphology change, riparian/upland vegetation loss or degradation, and impairment of water quality.

These in turn have a varying influence, in the extreme causing death or at a minimum temporary stress, on wildlife populations and their habitats. Hazards mentioned may affect a fairly large geographic area or be very localized in nature.

While the Division of Wildlife Resources (DNR) is charged with the management of wildlife, they do not have regulatory authority over water appropriations, water quality, development, or land management; except as allowed or occurring on properties they own. Therefore, when hazards occur, outside DWR property, DWR is limited to be a participating influence only through comments to the other regulatory agencies or individuals.

DWR management of wildlife is carried out largely through regulation of taking, controlling disturbance and/or possession of wildlife, and introduction or movement of species. However, there are numerous non-regulatory means (i.e. conservation agreements, memorandums of understanding, contracts, lease agreements, cooperative agreements, and technical assistance) by which DWR interacts with other agencies, groups and individuals, to have an influence on wildlife and/or their habitat.

Hazard Areas of Commentary Interaction

While not being able to control/regulate many of the elements necessary for the benefit of wildlife; DWR provides technical comments for the maintenance, protection, and enhancement of wildlife and/or habitats for various value reasons. It is too extensive to list all the areas of comment; however, the following are examples of fairly frequent concern:

- Steam Channel Alteration Permit Applications
- Water Rights Filings
- Energy and Mineral Exploration and Extraction Applications
- Federal Agency land management plans
- Waste Water Discharge Permit Applications
- Hydroelectric plant licensing or regimenting
- Urban and rural development project planning
- Utility transmission line style and locations
- Wetland alteration
- Federal land management planning
- Highway constructions

Utah Division of Drinking Water

Division of Drinking Water's Mission Statement is to "protect the public against waterborne heath risks through assistance, education, and oversight". The Division acts as the administrative arm of the Utah Drinking Water Board. It implements the rules, which they adopt. As such, it is engaged in a variety of activities related to the design and operation of Utah's public drinking water system. The Utah Drinking Water Board is an 11-person board appointed by the Governor. It is empowered by Title 19, Chapter 4 of the Utah Code to adopt rules governing the design, operations, and maintenance of Utah's "public drinking water system".

Safe Drinking Water Act
There is a Federal Safe Drinking Water Act, which applies to all public drinking water systems in the country. The U.S. Environmental Protection Agency (EPA) has given Utah "primacy" for enforcing the federal act within its boundaries. To qualify for this Utah's laws and rules governing public drinking water systems must be at least as strict as the federal law.

Sanitary Surveys
The Division performs sanitary surveys on the water systems, which is a compliance action that identifies system deficiencies.

Emergency Response Plans
The Division of Drinking Water requires water utilities to prepare emergency response plans under the State Safe Drinking Water Act, Utah Code Section 19-4. The Division operates according to DDW Rules: R309 gives them authority to administer actions: R309-301 through R309-104 and R309-113, R309-150, R309-301, and R309-211.

Utah Division of Solid and Hazardous Waste

The Tier II Chemical Inventory report, required by the Federal Emergency Planning and community Right-to-Know Act, requires facilities to submit lists of hazardous chemicals present on site. These reports are computerized and the information is provided to local emergency planning committees, the general public, and others for contingency planning purposes. To implement the Federal law, the State operates under Utah State Code, Section 63-5-5. The Division of Solid and Hazardous Waste requires that hazardous waste treatment storage and disposal facilities prepare an emergency response plan as required by regulations authorized by the State Solid and Hazardous Waste Act, Utah Code Section 19-6.

Other Agency programs are regulatory in nature requiring proper use or disposal of hazardous substances or pollutants. For example the Division of Solid and Hazardous Waste regulates the disposal of hazardous waste, the Division of Radiation Control regulates the proper usage and disposal of radioactive materials. As such there is a threat mitigation nature to these programs.

Utah Division of Water Quality

The Utah Division of Water Quality protects, maintains, and enhances the quality of Utah's surface and underground water for appropriate beneficial uses; the Division of Water Quality regulates discharge of pollutants into surface water, and protects the public health through eliminating and preventing water related health hazards which can occur as a result of improper disposal of human, animal, or industrial wastes while giving reasonable consideration to the economic impact.

Water Quality Fund and Wastewater Treatment Project Fund
The Division Manages the Water Quality Revolving Fund that can be used by local governments for water quality projects and a Wastewater Treatment Project Fund.

Abating Watershed Pollution
Federal and State regulations charge the Division with "preventing, controlling, and abating" watershed pollution. Other state and local agencies have similar responsibilities. The Watershed Approach forms partnerships with these groups to pool resources and increase the effectiveness of existing programs. For each watershed management unit, a watershed plan will be prepared. The watershed plan addresses management actions at several spatial scales ranging from those that encompass a watershed management unit to specific sites that are tailored to specific environmental conditions. Ground water hydrologic basins and eco-region areas encompassed within the units will also be delineated.

State Revolving Fund Program
In 1987, Congress replaced the Construction Grants Program, with the State Revolving Fund Program. Rather than provide direct grants to communities, the federal government provides each state with a series of grants, then each state contributes a 20 percent state match. Grants from the federal government are combined with state funds in the Water Quality Project Assistance Program (WQPAP) and are used to capitalize a perpetual source of funds to finance water quality construction control activities at below market interests rates. Projects eligible for WQPAP financing include such traditional activities as construction of wastewater treatment plants and sewers. The program also will finance non-traditional water quality-related activities such as agricultural runoff control, landfill closures, contaminated industrial property (Brownfield) remediation, stream bank restoration, and wellhead protection.

Local
Local governments depend upon local property taxes as their primary source of revenue. These taxes are typically used to finance services that must be available and delivered on a routine and regular basis to the general public. If local budgets allow, these funds are used to match Federal or State grant programs when required for large-scale projects. Many small mitigation projects are implemented by the County Emergency Managers, who are funded either partially or entirely by county governments.

Non-Governmental
Another potential source of revenue for implementing local mitigation projects are monetary contributions from non-governmental organizations, such as private sector companies, churches, charities, community relief funds, Red Cross, hospitals, Land Trusts and other non-profit organizations.

Paramount to having a plan deemed to be valid is its implementation. There is currently no new fiscal note attached to the implementation of this Plan.

Continued Public Involvement
Throughout the planning process, public involvement has been and will be critical to the development of the Plan and its updates. On a yearly basis the plan will be profiled during the meetings with each jurisdiction, i.e., the county commissioners and elected officials in the Six County Region to which the public is invited. The plan will also be available on the Six County website (http://www.sixcounty.com/) to provide additional opportunities for public participation and comment.

Six County Association of Governments staff has been designated by its Executive Board in preparing and submitting the *Six County Pre-Disaster Mitigation Plan*, which includes coverage for all incorporated cities and counties within the Six County Region, i.e., Juab, Millard, Piute, Sanpete, Sevier and Wayne Counties. The strategy of the Six County Association of Governments in preparing the plan is to use available resources in the most efficient and cost effective manner to allow its cities/towns and counties continued access to data, technical planning assistance and FEMA eligibility. In addition, the SCAOG will reach out to non-profits, public agencies, special needs organizations, groups and individuals in allowing them input and access to the plan. With limited resources, however, it becomes difficult to both identify and to individually contact the broad range of potential clients that may stand to benefit from the plan. This being the case, we have established the following course of action:

STEP 1. The SCAOG will publicly advertise all hearings, requests for input and meetings directly related to the Pre-Disaster Hazard Mitigation Plan process. SCAOG Executive Board meetings where plan items are discussed and where actions are taken will not receive special notifications as they are already advertised according to set standards. All interested parties are welcome and invited to attend such meetings and hearings, as they are public and open to all. Advertisement will be done according to the pattern set in previous years, i.e. the SCAOG will advertise each hearing and request for input at least seven days (7) in advance of the activity and will publish notices of the event in the newspapers of general circulation. The notices will advertise both the hearing and the means of providing input outside the hearing if an interested person is unable to attend.

STEP 2. The SCAOG has established a mailing list of many local agencies and individuals that may have an interest in the Pre-Disaster Hazard Mitigation Plan. Each identified agency or person will be mailed a notice of the hearings and open houses.

STEP 3. Comments, both oral and written, will be solicited and accepted from any interested party. Comments, as far as possible, will be included in the final draft of the Hazard Mitigation Plan; however, the SCAOG reserves the right to limit comments that are excessively long due to the size of the Plan.

STEP 4. Specific to risk assessment and hazard mitigation, needs analysis, and capital investment strategies, the SCAOG will make initial contact and solicitation for input from each incorporated jurisdiction within the region. All input is voluntary. Staff time and resources do not allow personal contact with other agencies or groups, however, comments and strategies are welcomed as input to the planning process from any party via regular mail, FAX, e-mail, phone call, etc. In addition, every public jurisdiction advertises and conducts public hearings on their planning, budget, etc. where most of these mitigation projects are initiated. Input can be received from these prime sources by the region as well.

STEP 5. The final draft of the Hazard Mitigation Plan will be presented to the SCAOG Executive Board at its regularly scheduled monthly meeting for adoption and approval to submit the document to State authorities. Executive Board policies on adoption or approval of items will be in force and adhered to. This document is intended to be flexible and in constant change so comments can be taken at any time of the year for consideration and inclusion in the next update. Additionally, after FEMA approval of the Plan, the Plan will be promulgated for each local jurisdiction for adoption by resolution.

STEP 6. The following policies will guide SCAOG staff in making access and input to the Hazard Mitigation Plan as open and convenient as possible:

A. Participation: All citizens of the region are encouraged to participate in the planning process, especially those who may reside within identified hazard areas. The SCAOG will take whatever actions possible to accommodate special needs of individuals including the impaired, non-English speaking, persons of limited mobility, etc.

B. Access to Meetings: Adequate and timely notification to all area residents will be given as outlined above to all hearings, forums, and meetings.

C. Access to Information: Citizens, public jurisdictions, agencies and other interested parties will have the opportunity to receive information and submit comments on any aspect of the Hazard Mitigation Plan, and/or any other documents prepared for distribution by the Six County Association of Governments that may be adopted as part of the plan by reference. The SCAOG may charge a nominal fee for printing of documents that are longer than three pages.

D. Technical Assistance: Residents as well as local jurisdictions may request assistance in accessing the program and interpretation of mitigation projects. SCAOG staff will assist to the extent practical, however, limited staff time and resources may prohibit staff from giving all the assistance requested. The SCAOG will be the sole determiner of the amount of assistance given all requests.

E. Public Hearings: The SCAOG will plan and hold public hearings according to the following priorities: 1- Hearings will be conveniently timed for people who might benefit most from Mitigation programs, 2- Hearings will be accessible to people with disabilities (accommodations must be requested in advance according to previously established policy), 3- Hearings will be adequately publicized. Hearings may be held for a number of purposes or functions including to: a-identify and profile hazards, b-develop mitigation strategies, and c-review plan goals, performance, and future plans.

F. Comment Period: The SCAOG will sponsor a 30-day public comment period prior to final plan submission. The comment period will begin with a public hearing to open the 30-day solicitation of input. Comments may be made orally, or in writing, and as far as possible, will be included in the final Six County Pre-Disaster Hazard Mitigation Plan according to the outlined participation rules.

Annex 1 – Six County Regional Hazards

Regional Hazards

Due to the geographic extent these hazards have not been mapped and risk assessments were unable to be compiled. Therefore all of the information for the following regional hazards is in the narrative below. The entire region is subject to these hazards with no unique risk affecting a single jurisdiction. Refer to each county Annex for a list of historical hazard events. Mitigation strategies are included in *Annex 8* and in *Appendices P-U.*

1. Severe Weather

Table 1: FEMA Hazard Profile for Severe Weather in the Six County Region

Frequency	Highly Likely
Severity	Moderate
Location	Regional event with higher wind speeds at the mouth of canyons and in the west desert.
Seasonal Pattern	None
Duration	6 to 24 hours
Speed of Onset	0 to 6 hours

Description of Location and Extent

For the purpose of this plan climatic phenomena of avalanche, tornados, lightning, high wind, and winter storms have been joined together under and referred to as severe weather.

High Winds

High winds can occur with or without the presence of another storm and are determined to be unpredictable in regards to time and place. Each of the six counties making up the Six County planning area has experienced high winds in the past, generally during the spring and summer months. These counties can expect regional high wind events in the future. Winds are usually strongest near the mouths of canyons and have resulted in the loss of power and the inability to heat homes and businesses. Winds in the past have damaged roofs, destroyed and knocked down large trees and fences, overturned tractor -trailers, railroad cars, and small airplanes.

Severe Storm

Severe storms can include thunderstorms, hailstorms, heavy snow or rain, and extreme cold. They are generally related to high precipitation events during the summer and winter months. Severe storms can happen anywhere in the region and the damage can be extensive especially for agriculture, farming, and transportation systems. They can also disrupt business due to power outages.

Thunderstorms

A thunderstorm is a storm made up of heavy rain or hail along with thunder and lightning resulting from strong rising air currents. Based on historical evidence thunderstorms can strike anywhere in the region mainly during the spring and summer months

Lightning

Lightning is the electric discharge accompanied by light between clouds or from a cloud to the earth. In Utah, lightning is the number one natural hazard killer. Lightning can also start wildland fires, which could be potentially fatal or disruptive.

Hailstorms

Hailstorms occur when freezing water in thunderstorm type clouds accumulates in layers around an icy core generally during the warmer months of May through September. Hail causes damage by battering crops, structures, and automobiles. When hailstorms are large (especially when combined with high winds), damage can be extensive. The risk of hailstorms is not targeted to any particular areas within the region.

Heavy Snow or Rainfall

Heavy amounts of precipitation from rain or snow can result in flash flood events. Historically, This region has been susceptible to these types of storms in the past. Major winter storms can produce five to ten times the amount of snow in the mountains than in the valley locations.

Some of the valley development occurs on old alluvial fans at the canyon mouths. During heavy precipitation flood waters and debris will occur on these same alluvial fans, damaging residential and commercial property along with infrastructure. The associated threat with heavy snowfall is avalanches. Heavy snow can also block roads, strand motorists, and disrupt business.

Extreme Cold

Sub-zero temperatures occur during most winters, however prolonged periods of extremely cold weather are infrequent. January is generally the coldest month of the year. Historically extreme cold in the region has disrupted agriculture, farming, and crops. Extreme cold also affects life, especially vulnerable are the young and elderly and animals.

Avalanche

Avalanches occur on steep slopes between 35 and 45 degrees and therefore the mountainous areas as well as the foothills around the region are all vulnerable. Even though most avalanches occur on forested lands they affect mostly city and county dwellers. Therefore, avalanches should be given a priority in Utah due the number of historical occurrences and historic deaths. Avalanche response and often body recover is often conducted by county staff with county funding. Search and rescue efforts can be prevented or reduced through basic avalanche awareness skills.

The probability of a future event is likely dependant on the amount of heavy snowfall during a given year. Most deadly avalanches occur in the backcountry away from developed areas. Avalanche control is performed regularly in developed ski areas to minimize the threat and increase awareness. The Avalanche Center was initiated as another resource for measuring risk and increasing awareness to the residents of the Six County region.

Tornado

Historically, atmospheric conditions have not been favorable for the development of tornadoes in Utah due to the dry climate and mountainous terrain. Utah averages about two tornados per year. Utah tornados are usually no more than 60 feet wide at the base and last up to 15 seconds. Tornadoes occur during the months of May, June, July, and August usually preceding a cold front. Utah is one of the lowest ranked nations for incidences of tornadoes with only one F2 or stronger tornado every seven years.

2. Drought

Table 2: FEMA Hazard Profile for Drought in the Six County Region

Frequency	Highly Likely
Severity	High
Location	Regional event with greater severity occurring in those smaller towns whose wells have gone dry.
Seasonal Pattern	More severe in late Summer after the reservoirs have dried up and the water table has dropped.
Duration	2 to 6 years
Speed of Onset	2 to 6 months

Description of Location and Extent

Drought refers to an extended period of deficient rainfall relative to the statistical mean for a region. The entire region is currently experiencing a drought from 1999- present. Drought dramatically affects this area because of the lack of water for agriculture and industry, which limits economic activity, irrigation and culinary uses. The severity of the drought results in depletion of agriculture lands and deterioration of soils. In the Southeastern region the risk of drought is high.

Drought is not targeted to any particular area within the region and the geographic extent of drought is hard to identify or map on a local or even county level. During the making of this plan, drought related GIS layers were unavailable to complete the mapping and analysis portions of the plan. Therefore, a vulnerability analysis including types and numbers of buildings, critical facilities, and infrastructure affected by drought were unable to be determined.

The secondary threats associated with drought include infestation and wildfire, all of which the region as historically been susceptible to.

Impacts of Drought

- Decreased land prices
- Loss to industries directly dependent on agricultural production (machinery and fertilizer manufactures, food processors, dairies, etc)
- Unemployment from drought related declines in production
- Strain on financial institutions (foreclosures, more credit risk, capitol shortfalls)
- Revenue losses to federal, state, and local governments from reduced tax base.
- Reduction of economic development.
- Rural population loss and relocation to larger cities.
- Loss to recreation and tourism industry
- Energy related effects

- Water suppliers revenue shortfalls
- Higher cost of water transport
- Decline in food production causes increase in food prices and increase in importation of food

Social
- Mental and physical stress
- Health related low flow problems including cross-connection contamination diminished sewage flows, increased pollutant concentrations, and reduced fire-fighting capabilities.
- Loss of human life
- Public safety concerns caused by increased threat of forest and range fires
- Increases in conflicts of water users.
- Changes lifestyles of those living in rural areas.
- Reduction of modification of recreation activities.
- Public dissatisfaction with government drought response plan

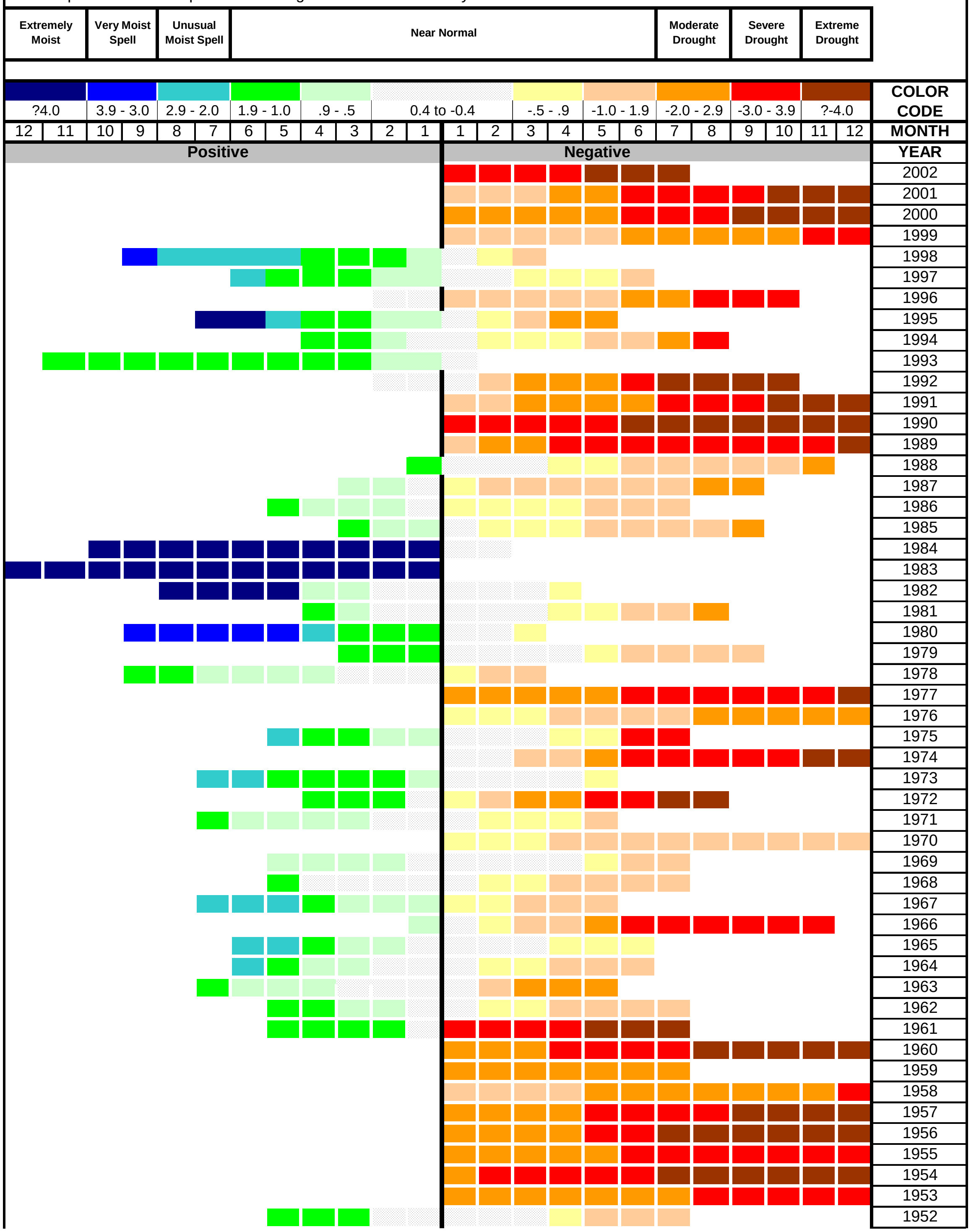
Environmental
- Damage to animal species
- Reduction and degradation of fish and wildlife habitat
- Increased contact of wild animals with agricultural producers.
- Loss of biodiversity
- Lower water levels in reservoirs and lakes
- Reduced stream flow.
- Loss of wetlands
- Increased ground water depletion, land subsidence, reduced recharge.
- Increased number and severity of wild fires.
- More dust and pollutants in the air.
- Visual and landscape qualities diminished.

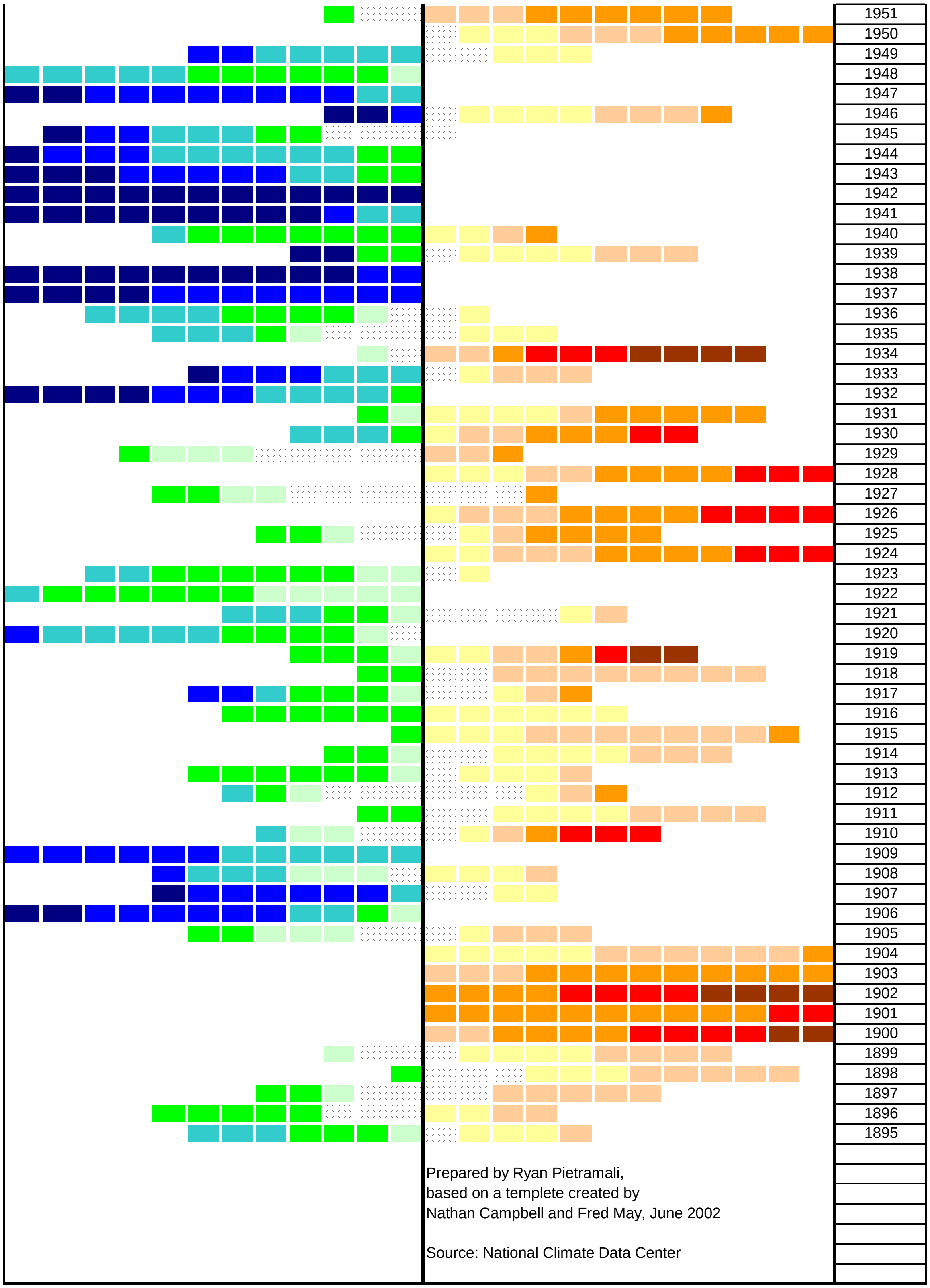
Utah and Six County Association of Government Drought History
According to Utah's annual Palmer Drought Severity Index Charts, Utah has experienced as many as 60 years of drought out the past 100 years, with several of these being multi-year droughts" (35). Multi-year droughts affecting the entire state occurred during 1896-1905, 1930-1936, 1939-1940, 1953-1956, 1958-1964, 1976-1979, and 1995-1996. Single year droughts occurred during "1924, 1966, and 1974" (State of Utah 35). The Chart below provides a drought history for the Six County planning area, using date for Utah climate zone one and four, from the present back to 1895. Drought severity is measured using the Palmer Drought Severity Index (PDSI). The PDSI drought severity is represented monthly with a numerical id between +6 and –6 with more severe droughts having higher negative numbers.

The Palmer Drought Severity Index developed by Wayne Palmer in the 1960's, measures drought severity using temperature and rainfall to determine dryness. The Palmer Drought Severity Index or (PDSI) has become the "semi-official" drought index as it is "standardized" to local climate and can be applied to any part of the country. The PDSI uses zero as normal and assigns a monthly numerical id between +6 and -6 with, server droughts having higher negative numbers. Thus, a moderate drought is minus 2, a sever drought minus 3, and extreme drought is minus 4. Excess rain is expressed using plus figures, with plus 2 representing moderate rainfall, etc.

PALMER DROUGHT SEVERITY INDEX CHART
UTAH CLIMATE DIVISION 1
1895 - 2001

Chart depicts numbers of positive and negative months for each year.

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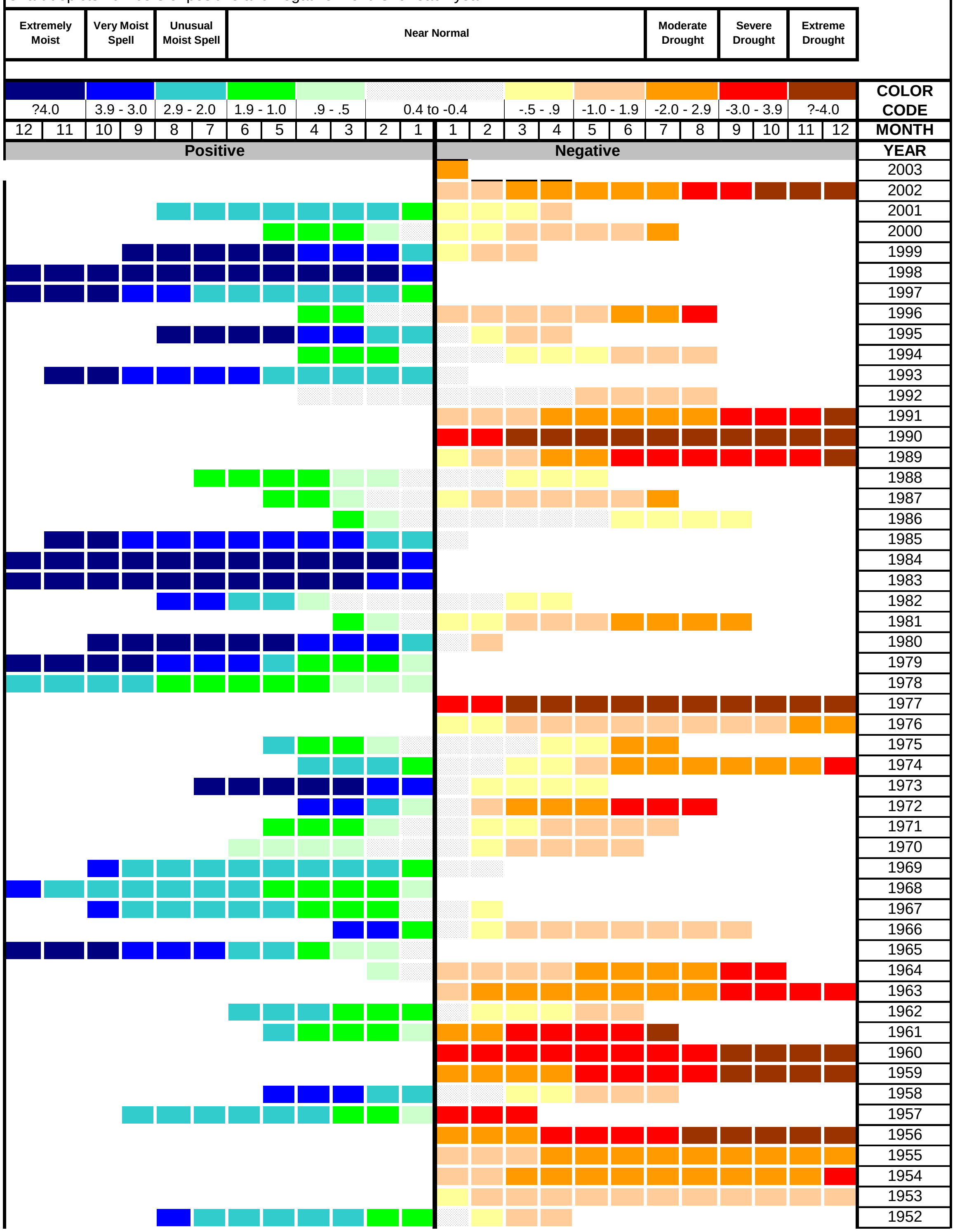
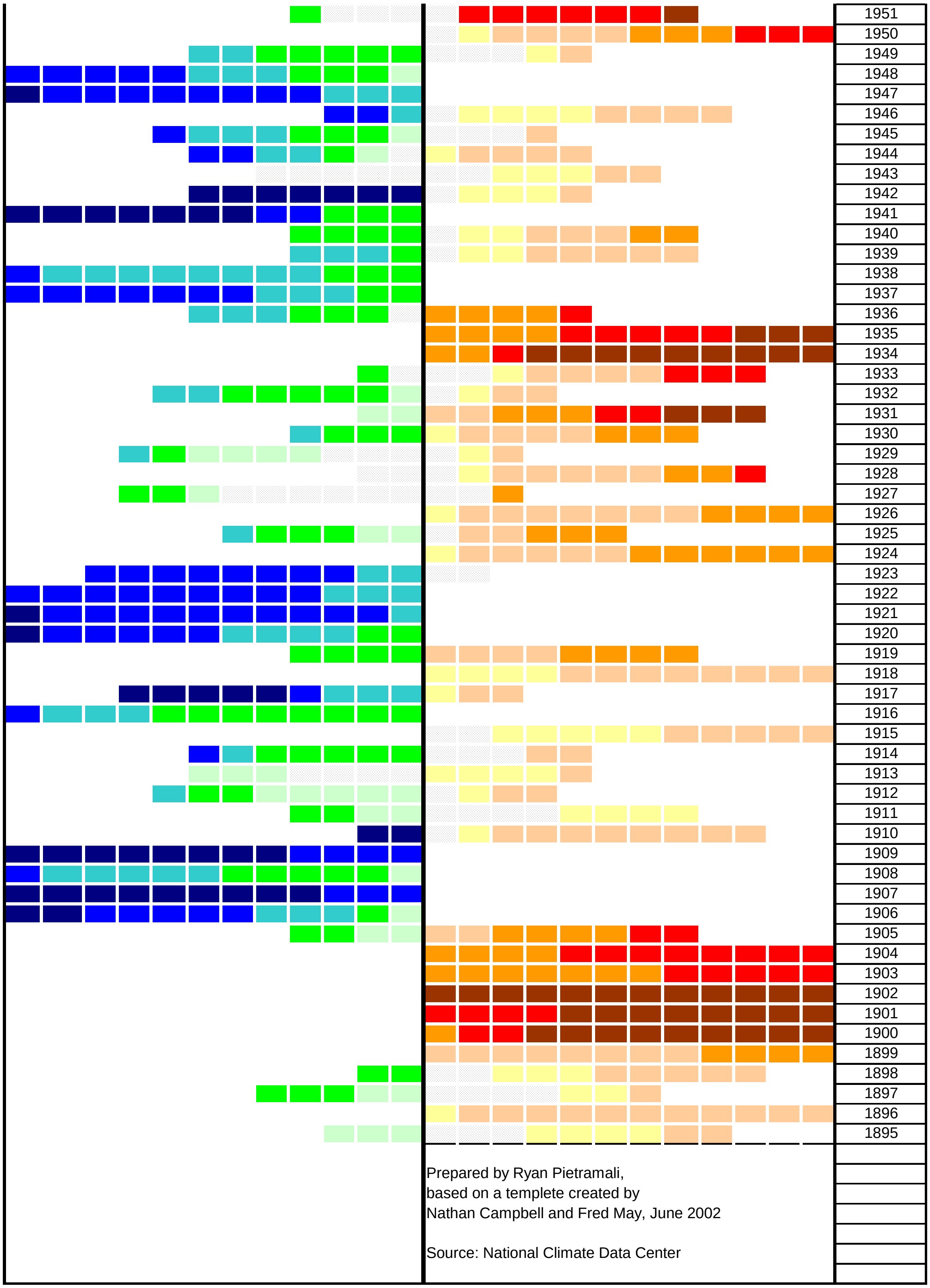
Prepared by Ryan Pietramali,
based on a templete created by
Nathan Campbell and Fred May, June 2002
Source: National Climate Data Center

PALMER DROUGHT SEVERITY INDEX CHART
UTAH CLIMATE DIVISION 4
1895 - 2001

Chart depicts numbers of positive and negative months for each year.





Prepared by Ryan Pietramali,
based on a templete created by
Nathan Campbell and Fred May, June 2002

Source: National Climate Data Center

Identifying Vulnerable Assets

Identifying assets vulnerable to regional hazards is problematic. There is a limited GIS data for regional hazards, limiting GIS analysis methods employed through out this plan. Certain locations are more vulnerable to regional hazards as addressed above; examples include avalanche, high wind, and lightning. Yet humans have built very little in these areas. Over the last 100 years lightning and avalanches have caused a number of deaths in the planning area but resulted in very little property damage. For the hazards of drought, tornadoes, and winter storm the risk is virtually the same over the entire planning area. Discussion among planning team members resulted in the conclusion of extreme inaccuracy in suggested methods for identifying vulnerable assets in regional hazard areas.

Annex 2 -- Juab County

In order to effectively identify and mitigate natural hazards in Juab County, a Pre-Disaster Mitigation Planning Team representing Emergency Management and each jurisdiction in the county was created. Table 1 names the members of this team. Input from the team was used in organizing hazard mitigation strategies outlined in *Annex 8* and *Appendix P* of this plan.

Table 1: Juab County Pre-Disaster Mitigation Planning Team

Name	Representing:
Fred Smalley, Emer. Mgr.	Juab County
Wm. Boyd Howarth, Commissioner	Juab County
Robert Steele, Commissioner	Juab County
Neil Cook, Commissioner	Juab County
Lloyd Conder, Mayor	Eureka
Robert Shepherd, Mayor	Levan
Bryce Lynn, Mayor	Mona
Chad Brough, Mayor	Nephi
Darrell Allred, Mayor	Rocky Ridge
Kelly Allen	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Past Hazard Events in Juab County

Understanding the past is often the key to discovering what the future hold, this is especially true when planning for natural disasters. The fact that cities within Juab County have experienced, for example, flooding in the past means flooding can occur in the future. While over time some of this has been mitigated for the low frequency of occurrence often results in hazards with little or no mitigation. Table 2 provides a brief history of Juab County natural disasters. This table includes only sizable events found during our research, and may not represent the total history.

Table 2: Juab County Natural Disaster History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Avalanche	February 8, 1899	Near Eureka	Property damage	No loss of life
Flood	July 31, 1936	Eureka/Tintic	Considerable flood damage to roads and streets. Mud covered rail tracks.	

Hazards	**Date**	**Location**	**Critical Facility or Area Impacted**	**Comments**
Flood	August 10, 1941	Mona/Jericho	Damaged railroad tracks, property and road network	
Flood	July 21, 1943	Nephi	Property, roads, and bridges damaged	Salt Creek Canyon
Flood	August 15, 1955	Nephi	Business establishments, farms and irrigation ditches. 7,000 turkeys were killed.	Bigelow Canyon Cloudburst
Flood	August 4 1961	Jericho, Nephi, and Eureka	Utah Highways 11, 36, and 132 and U.S. 6 covered with water and debris	Heavy rains
Flood	July 18, 1964	Eureka	Homes and streets	Worst storm in many years
Flood	July 22, 1968	Tintic	Homes, roads, electric, and telephone lines.	
Flood	August 2, 1968	Levan	City streets and irrigation ditches	Pigeon Creek Canyon over $15,000 in damages
Flood Presidential	1984	County Wide	Creek channels filled with sediment, damaged bridges, culverts, roads, water lines	Public assistance total $1,310,566
Earthquake	August 1, 1900	Eureka	Unknown	Richter Magnitude 5.7
Earthquake	November 28, 1958	Nephi	Unknown	Richter Magnitude 4.3
Earthquake	July, 7 1963	Levan	Unknown	4.4 two miles west of Levan

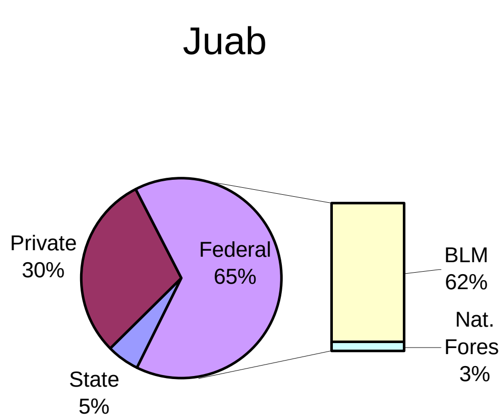
Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Landslide	Unknown	Pole Canyon	Unknown	Base of Mt. Nebo
Landslide	Unknown	York landslide	Unknown	
Landslide	Unknown	Crouch Creek	Unknown	Manning Canyon
Severe Weather	September 23, 1992	Callao	2 deaths	Lightning Geologists working on barren ridge
Wildfire	1999	Sand Mountain Fire	Unknown	6,000 Acres
Wildfire	1999	Rail Road Fire	Unknown	61,009 Acres
Wildfire	2000	West Mona Fire	Unknown	6,692 Acres

(Source: History of Juab County, Utah State Historical Society.)

Development Trends

Approximately 733,971 acres or 30% of the total land area in Juab County is privately held and outside the incorporated areas is almost entirely vacant. The other 70% is owned by the state or federal governments and aside from extractive industry is beyond the reach of development. Since land ownership determines how and where development proceeds, Figure1 helps explain Juab County's development trends.

Figure 1: Juab County Land Ownership



The vast majority of landslides, debris flows and wildfires occur on these public lands with virtually no impact on development. Of the privately held land, most is not developable due to a lack of water and county zoning requirements of water access and a minimum of 160 acres per house. Other limitations to development include steepness of the terrain, flash flood plains and accessibility. There is still plenty of infill within city limits that can be utilized for safe development without developing in unincorporated, sparsely populated, or hazardous areas. Juab County requires UBC on all new or proposed buildings. New subdivisions require a grading and drainage plan to mitigate any flooding, which may occur. Since most of the privately held land is along the relatively safe and accessible I-15 corridor, development is occurring in this general area. A railroad spur extending southward into Sanpete and Sevier Counties is in the planning stage of development. A major grain receiving station has been completed and is located south of Nephi. A large animal rendering plant will open soon southwest of Nephi at the intersection of I-15 and the Union Pacific Railroad. The area west of Mona will have an operating electrical grid station in the near future.

Historically, Eureka, Mammoth, Silver City and other mining towns were prospering in their heyday of the early 20th Century. Most of the mines are no longer functioning. Now, of the many mining towns, only Eureka is incorporated and is smaller today than at its peak in the 1920s. However, Eureka has been steadily growing for the past decade. The largest city, Nephi, had its start in agriculture, which still plays an important part in the economy of the city and county. Founded in 1851 as an important way station for those traveling to the Territorial Capitol of Fillmore, Nephi is located approximately halfway between Salt Lake City and Fillmore. Transportation development had its beginnings in the original wagon trails, which brought the pioneers to this area. Later roads and the Union Pacific Railroad followed this north-south route and finally I-15 was built roughly using this same corridor. This corridor is where future development is likely to happen because of the private lands along this major transportation artery. Except for lands on the alluvial fans to the east and adjacent to the creeks, this corridor is relatively safe from natural hazards.

1. Earthquake

Table 3: FEMA Hazard Profile for Earthquake in Juab County

Frequency	Possible
Severity	Catastrophic
Location	A large magnitude earthquake would produce ground shaking felt throughout the entire region. Surface fault rupture is expected in areas of known historic fault movements, for earthquakes with a magnitude 6.5 or greater.
Seasonal Pattern	None
Duration	Actual ground shaking will be under one minute yet after shocks may occur for several weeks after.
Speed of Onset	No warning

Description of Location and Extent

The Six County region's earthquake threat from the Intermountain Seismic Belt and other crustal rock strain release areas is high; although there is limited risk to population due to the large areas of undeveloped lands those living in the region are at an elevated risk. During historic times the largest recorded earthquake in Juab County has not reached above 5.7 on the Richter magnitude scale, yet geologic investigation has determined much larger events have happened in the recent geologic past and could happen in the future. These events are associated with numerous faults, which exhibit signs of prior movement during the quaternary time period or the last 1.6 million years: These faults are listed in Table 4:

Table 4: Fault Line Movement

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Wasatch fault zone - Nephi section	Latest Quaternary (<15,000 years)	1 - 5 mm/yr	Sectioned
Wasatch fault zone - Levan section	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Sectioned
Wasatch fault zone - Levan section	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Sectioned
Lime Mountain fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Deep Creek Range (east side) faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Fish Springs fault	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Fish Springs fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Simpson Mountains faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Sheeprock Mountains fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple

NAME	MOVEMENT	SLIPRATE	STRUCTURE
East Tintic Mountains (west side) faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
East Tintic Mountains (west side) faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Long Ridge (west side) faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Long Ridge (west side) faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Juab Valley (west side) faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Suspected
Drum Mountains fault zone	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Crater Bench faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Little Valley faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Little Valley faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Little Valley faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Sage Valley fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Gunnison fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple

HAZUS-MH Vulnerability Assessment
HAZUS-MH was used to determine vulnerability to earthquakes in the Six County planning area. Tables 5-9 are a summary of results from the HAZUS MH model. Damage and loss estimates are based on a 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete Juab County HAZUS MH run is available in *Appendix O.*

Number of people
Whether an earthquake occurs at night, during the day, or during a commute plays a significant role in estimating the number of casualties as outlined in Table 5.

Table 5: Casualties

Casualties	Nighttime –Minor	50
	Nighttime –Major	1
	Nighttime -Fatalities	3
	Daytime –Minor	61
	Daytime –Major	2
	Daytime- Fatalities	4
	Commute –Minor	49
	Commute –Major	2
	Commute-Fatalities	3

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 6 lists the number buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 6: Building Damage by Count with Moderate to Complete Damage

Category	Number of Structures	Total Cost in millions of dollars **
Residential	164	42.63
Commercial	5	8.24
Industrial	8	13.96
Totals	947*	65.82**

*****Includes all building categories with moderate to complete damage.
** Structural, non-structural, content, inventory.

Infrastructure Types and Amounts
Table 7 shows which critical facilities will receive damage and how much damage will result.

Table 7: Critical facilities

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	1	1	0	0
Schools	6	1	0	0
EOCs	1	0	0	1
Police Stations	2	0	0	0
Fire Stations	1	0	0	1

Debris Removal –Table 8 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour.

A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 8: Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	42
Loads (25 tons per load)	1,680

Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 9 provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 9: Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	1
People Displaced	3
Value Exposed (thous. $)	168

2. Floods

Table 10: FEMA Hazard Profile for Floods in Juab County

Frequency	Likely
Severity	Limited
Location	Flooding would occur in and along flood plains.
Seasonal Pattern	Juab County's main flooding threat is from snowmelt runoff during spring months.
Duration	The type of event determines the duration of flooding; flooding due to summer thunderstorms can last a couple of hours whereas flooding due to spring runoff can last weeks.
Speed of Onset	Six to twelve hours.

Description of Location and Extent
Based on the flooding which occurred during the spring of 1983 and 1984 both as a result of rapid snow melt events, experience would suggest these events would appear to be a greater hazard than cloudburst storms. Yet serious hazards could result from either storm. The entire county can experience flooding near the low-lying areas along streams and around lakes. Flooding is of particular concern along Eureka Creek, Willow Creek, Salt Creek, Chicken Creek, and Pigeon Creek. The potential for debris flows exists for all new development along the foothills of the Wasatch Range. This treat needs to be evaluated on know alluvial fans.

Description of Type
Precipitation in Juab County originates from two major sources. Moisture laden polar pacific air entering the area from the west or northwest during the winter produces large general storms, which most often result in heavy snowfall in the upper elevations and either snowfall or moderate intensity rainfall in the lower elevations.

The second major source of precipitation in the area arises from tropical air masses entering from the south and southwest out of the Gulf of Mexico during the summer months. Often wrongly referred to as monsoons these air masses cause high intensity convective cloudburst storms, which are augmented by the orthographic lifting which occurs as the air mass passes over neighboring mountains.

Precipitation from these two types of storms can produce flash floods, snowmelt floods, post wildfire/damaged watershed floods, and severe winter weather.

Note on Vulnerability Assessment
At this time, data was insufficient to conduct a risk analysis for flood events in Juab County. Flood Insurance Studies were study were applicable to aid in determining risk.

However, the current mapping projects being led by the county and state will result in better data that will assist in understanding risk. As part of its efforts to mitigate hazards and protect lives and property from the devastating effects of natural disasters, FEMA aims to provide individuals, businesses, and communities with information and tools to work proactively to mitigate hazards and prevent losses resulting from disasters. One of these tools is the new HAZUS MH flood model. Unfortunately at the current time this model does not work well enough to complete loss numbers for each jurisdiction in the county.

The U.S. Army Corps of Engineers wrote a Flood Hazard Identification Study (see *Appendix N)* which is included in the flood mitigation goals found in *Annex 8* and *Appendix P* of this plan. This study looks predominately at jurisdictions which are unmapped or mapped as D zones by the National Flood Insurance Program.

3. Landslides

Table 11: FEMA Hazard Profile for Landslides in Juab County

Frequency	Likely
Severity	Negligible
Location	Mass wasting in Juab County is located predominately along Salt Creek Canyon (see Map 3.1 on p.20 of this Annex).
Seasonal Pattern	Landslides most often occur within Juab County during spring months with higher than normal amounts of precipitation.
Duration	Several months
Speed of Onset	No warning

Description of Location and Extent
The map "Juab County Landslide Map 3.1" shows the locations of potentially active landslides, and identifies historical landslides and their locations. Landslides are generally located in well-defined, localized areas, but when they occur is usually unpredictable. The impact of a landslide can be countywide.

Several areas in the county are at risk to landslides. Rocky Ridge is the only jurisdiction to have historic landslide activity within its boundaries. Yet Nephi and Rocky Ridge both have areas of known landslide risk outside of their boundaries. This should be given consideration before jurisdictions annex land.

Structure loss
Our analysis, using best available data, only found two acres and one household in Rocky Ridge Town (see Table 12) vulnerable to landslides within Juab County. The extent and cost of damage to roads and electric infrastructure are shown in Tables 13 and 14, respectively.

Table 12: Structure Loss and Value as a Percentage of Total Acreage.

City Name	Acres of Historically Active Landslides 1847 to Present	Households Vulnerable to Landslide/Cost*
Rocky Ridge	2	1/95,000

*Includes value of land.

Table 13: Roads

Name	**Miles**	**Estimated Cost**
Local Neighborhood/local/city street	94.2	227,351,700
State Route 132	.7	1,689,450
Interstate I-15	4.8	11,584,800

Table data represents total length of roads, which overlay historically active landslides.

Railroads

This analysis shows no railroads vulnerable to landslides, yet railroad track east of Rocky Ridge Town is very near an area of known landslide activity.

Table 14: Electric Infrastructure

Name	Description	Estimated Cost
KV-46 lines	.5 Miles	24,140
KV-138 Lines	1.7 Miles	82,077
KV-345	1.1 Miles	53,108

4. Wildfire Risk

Table 15: FEMA Hazard Profile for Wildfire in Juab County

Frequency	Likely
Severity	High in the Wildland Urban Interface
Location	Entire county except cultivated grounds and sand dunes.
Seasonal Pattern	Most wildfires affecting Juab County occur during mid to late summer months (fire season).
Duration	The amount of time needed to contain a wildfire depends on a variety of uncontrollable variables such as: wind speed, relative humidity, type, and moisture content of fuel, weather, and topography. Thus containment time varies for each fire.
Speed of Onset	0 to 6 hours is the minimum amount of time given to homeowners in order to evacuate.

Description of Location and Extent
The Division of Emergency Services and Homeland Security augmented a statewide wildfire database to represent wildfire vulnerability into five categories: Extreme, High, Medium, Low, and Very Low. These ratings cover all of Juab County and are based on the type and density of vegetation in each area. Additional factors influencing wildland fires such as weather conditions, wind speed and direction are not considered in this risk assessment.

Eureka, Rocky Ridge, and Nephi all have a large amount of high wildfire risk acreage in or around their city. The mitigation section of this plan addresses this through education and Living with Fire participation.

See Map 4.1 on p. 21 of this Annex for a visual display of location and severity of wildfire risk in Juab County. Tables 16-19 show the number of acres and households at different levels of wildfire risk in Juab County.

Table 16: Acres in Wildfire Area

County Name	Acres of Extreme	Acres of High	Acres of Moderate	Acres of Low/Very Low
Juab	85	160,430	391,656	1,629,077

Table 17: Unincorporated County

County	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Juab	1/76,000	208/15,808,000	506/38,456,000

Table 18: Incorporated Juab County

City Name	Acres of Extreme	Acres of High	Acres of Moderate
Eureka	None	532	366
Levan	None	None	None
Mona	None	None	None
Nephi	24	428	18
Rocky Ridge	None	None	337

Table 19: Structures in Wildfire Area

City Name	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Eureka	No known risk	194/14,744,000	133/10,108,000
Levan	No known risk	No known risk	No known risk
Mona	No known risk	No known risk	No known risk
Nephi	12/912,000	248/18,848,000	9/684,000
Rocky Ridge	No known risk	No known risk	20/1,520,000

*Excludes content value, which would result in, and increase of 50% to the values listed.

Tables 20-22 show extent and cost of wildfire risk to roads, railroads, and electric infrastructure in Juab County.

Table 20: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	1,785	4,308,097,500
State Route 28	23	55,510,500
State Route 36	8.8	21,238,800
State Route 41	.37	892,995
State Route 67	1.1	2,654,850
State Route 78	25	60,337,500
State Route 91	6.6	15,929,100
State Route 132	43.4	104,745,900
US Highway 6	56.2	135,638,700
Interstate I-15	90.6	326,160,000

Table data includes road lengths within areas determined to have an extreme, high, or moderate risk to wildfire as determined by the Utah Statewide Fire Risk Assessment.

Table 21: Railroads

Railroad	Miles	Estimated Cost
Railroad	50.2	121,050,000

Table 22: Electric Substations

Name	Description	Estimated Cost
Eureka	115 KV	10,000,000
Mona	230 KV	20,000,000
Martin Marietta	115 KV	10,000,000
Ockey	115 KV	10,000,000
Mills	115 KV	10,000,000
Coastal States Energy	PacifiCorp/115 KV	10,000,000
KV-46 lines	59.1 Miles	2,853,000
KV-138 Lines	30.7 Miles	1,482,000
KV-345	64.5 Miles	3,114,000

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5. Problem Soils

Table 23: FEMA Hazard Profile for Problem Soils in Juab County

Frequency	Likely
Severity	Negligible (10-25% of jurisdiction affected)
Location	Typically occur at the valley's boundary with foothills.
Seasonal Pattern	None
Duration	Problems associated with soils last for long periods of time.
Speed of Onset	More than 24 hour warning time.

Description of Location and Extent
The silica dunes are expanding in the west desert, but are not threatening any incorporated areas in Juab County. Soils with expansive characteristics exist east of Nephi manly on US Forest Service Land. See Map 5.1 on p.22 of this Annex.

6. Dam Failure

Table 24: FEMA Hazard Profile for Dam Failure in Juab County

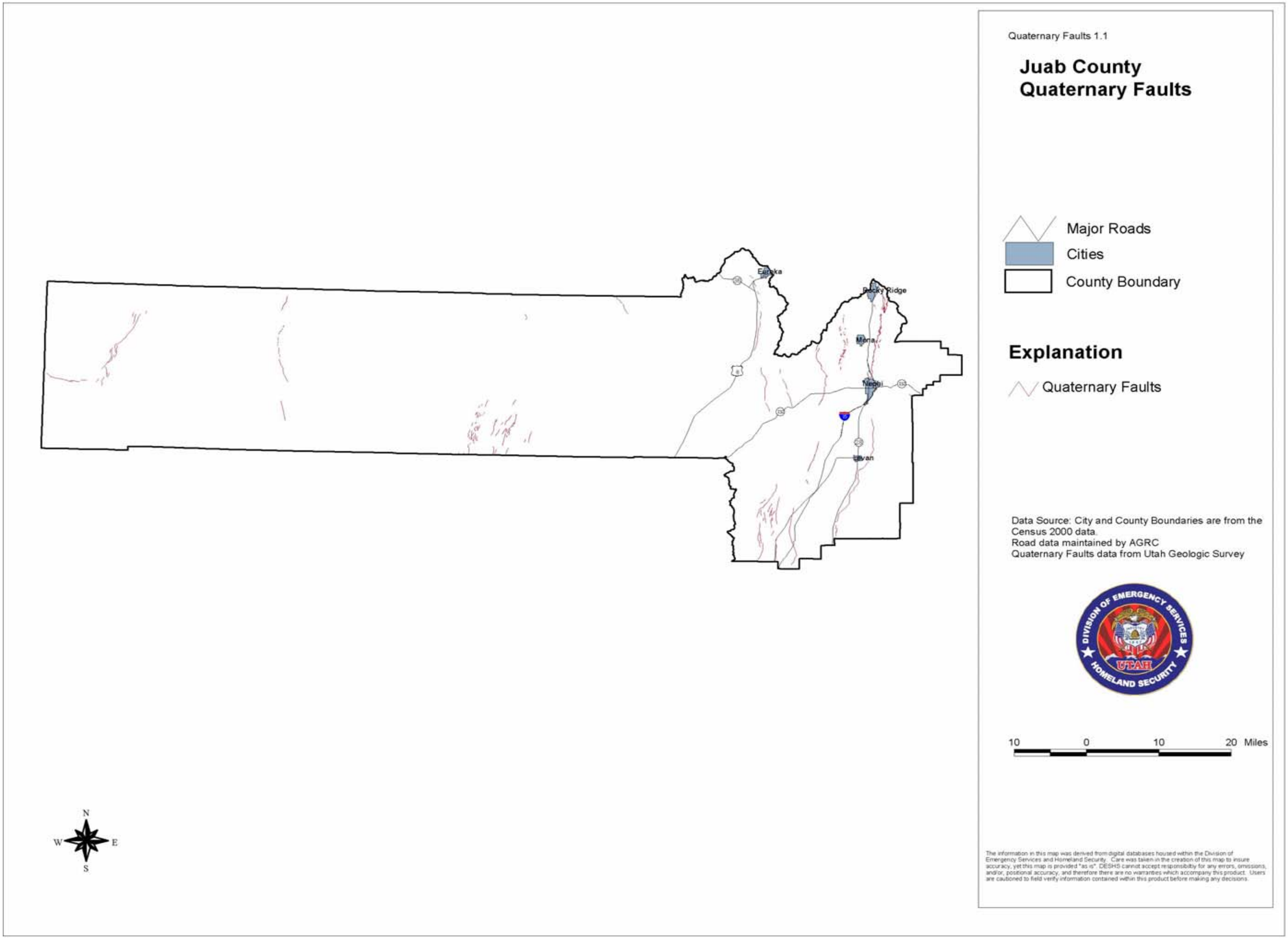
Frequency	Possible
Severity	Limited
Location	Would occur downhill from existing dams.
Seasonal Pattern	None
Duration	Depends on dam and type of break; Could be a wall of water which passes through in a few hours, or a slower break which could last for weeks.
Speed of Onset	6 to 12 hours.

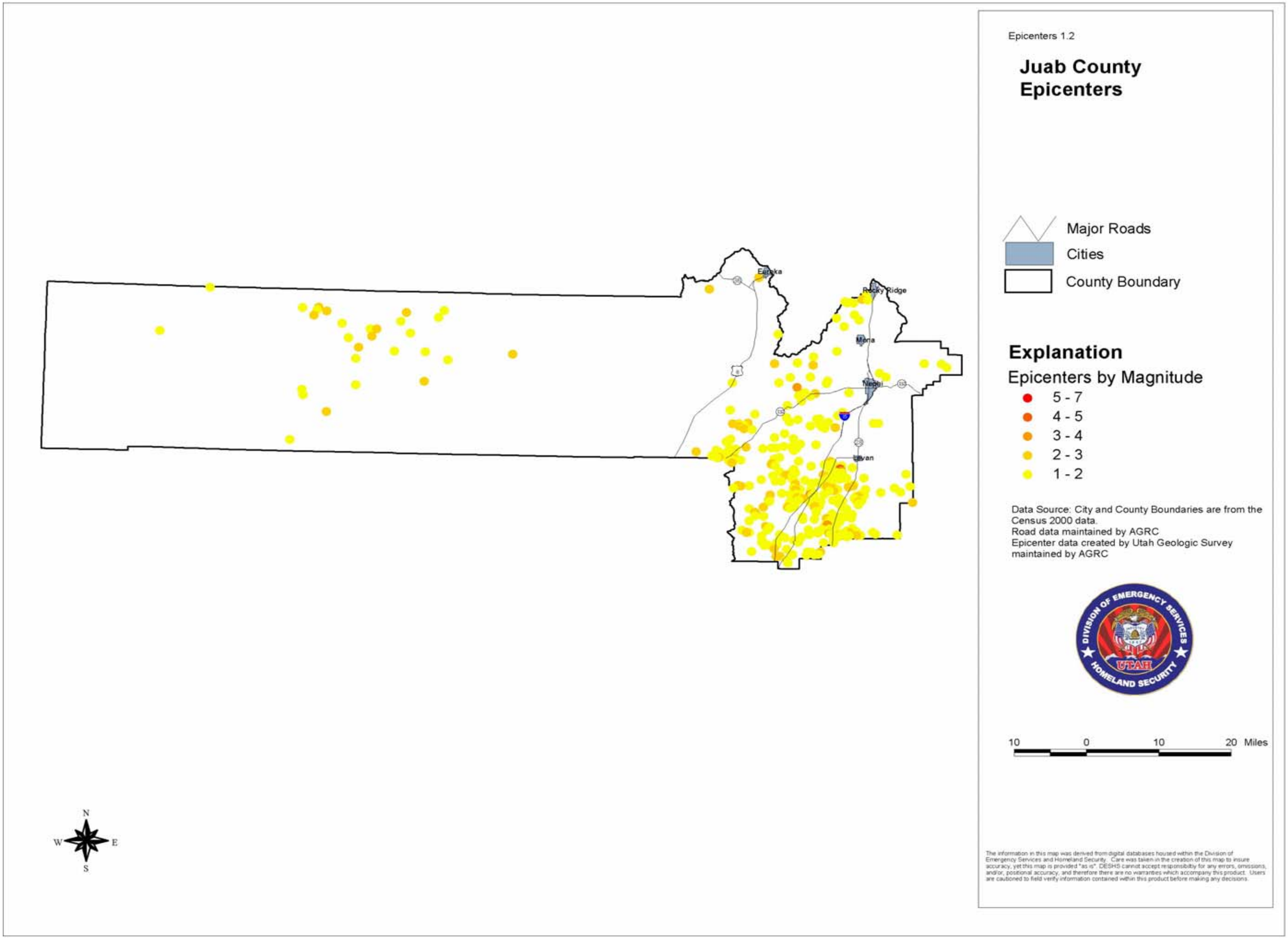
Description of Location and Extent
Of the dams located in Juab County only two dam are considered a high hazard. A high hazard is defined as a possibility of life being lost due to dam failure. All dams, regardless of rating should be monitored. It should be noted, dam safety hazard classifications are in the event of dam failure and are based upon the consequences of dam failure. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure. The areas of greatest danger to dam failure are north of Mona Dam (southwest of Rocky Ridge Town) and west of Sevier Bridge Dam (about 15 miles southwest of Levan Town). These areas are virtually uninhabited at the present time. See Map 6.1 on p.23 of this Annex.

The high risk dams in Millard County are the following (see Table 25):
- Mona
- Sevier Bridge

Table 25: High Risk Dams

Name	Year Completed	Type	Storage Acre Feet	Breach Flow cfs
Mona	1895	Earth Fill	19190	15000
Sevier Bridge	1914	Earth Fill	236145	185000


Quaternary Faults 1.1
Juab County
Quaternary Faults
Major Roads
Cities
County Boundary
Explanation
Quaternary Faults
Eureka
Rocky Ridge
Mona
Nephi
Levan
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Quaternary Faults data from Utah Geologic Survey
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
N
W
E
S
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.


Epicenters 1.2
Juab County Epicenters
Eureka
Rocky Ridge
Mona
Nephi
Levan
Major Roads
Cities
County Boundary
Explanation
Epicenters by Magnitude
5 - 7
4 - 5
3 - 4
2 - 3
1 - 2
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Epicenter data created by Utah Geologic Survey maintained by AGRC
10 0 10 20 Miles
N
W
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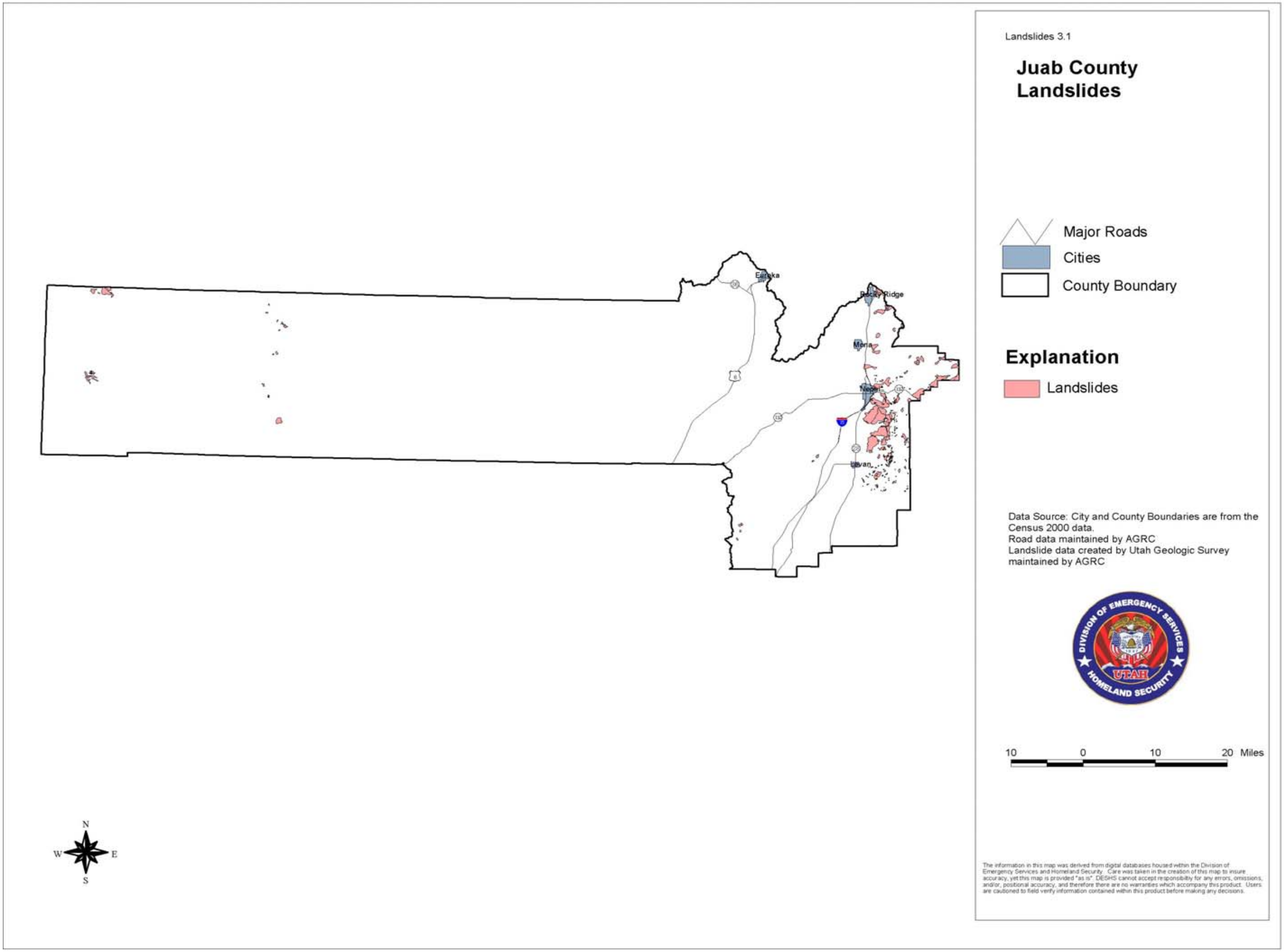
S
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.


Landslides 3.1
Juab County Landslides
Major Roads
Cities
County Boundary
Explanation
Landslides
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Landslide data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
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Eureka
Rocky Ridge
Mona
Nephi
Levan
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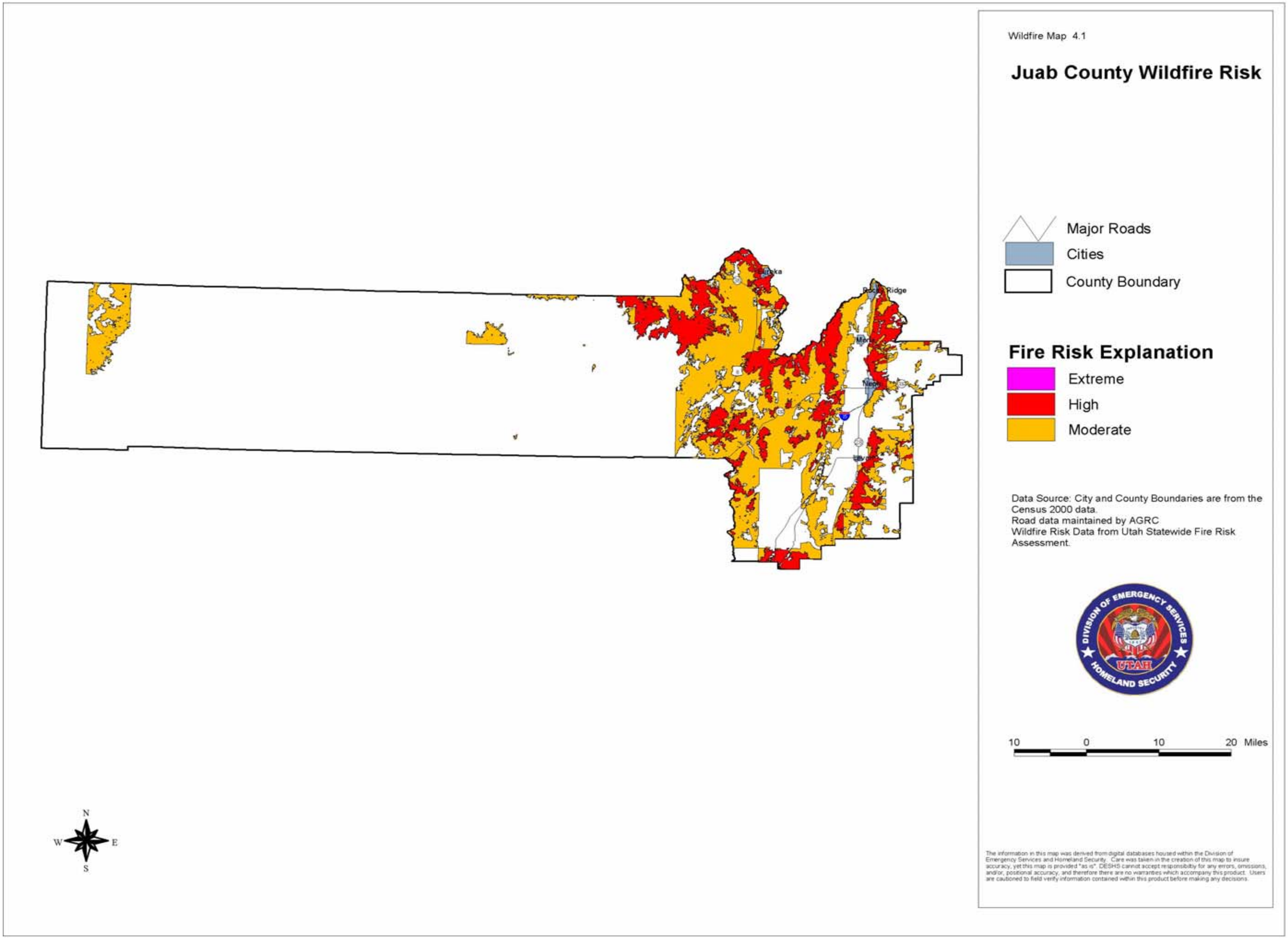

Wildfire Map 4.1
Juab County Wildfire Risk
Major Roads
Cities
County Boundary
Fire Risk Explanation
Extreme
High
Moderate
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Wildfire Risk Data from Utah Statewide Fire Risk Assessment.
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
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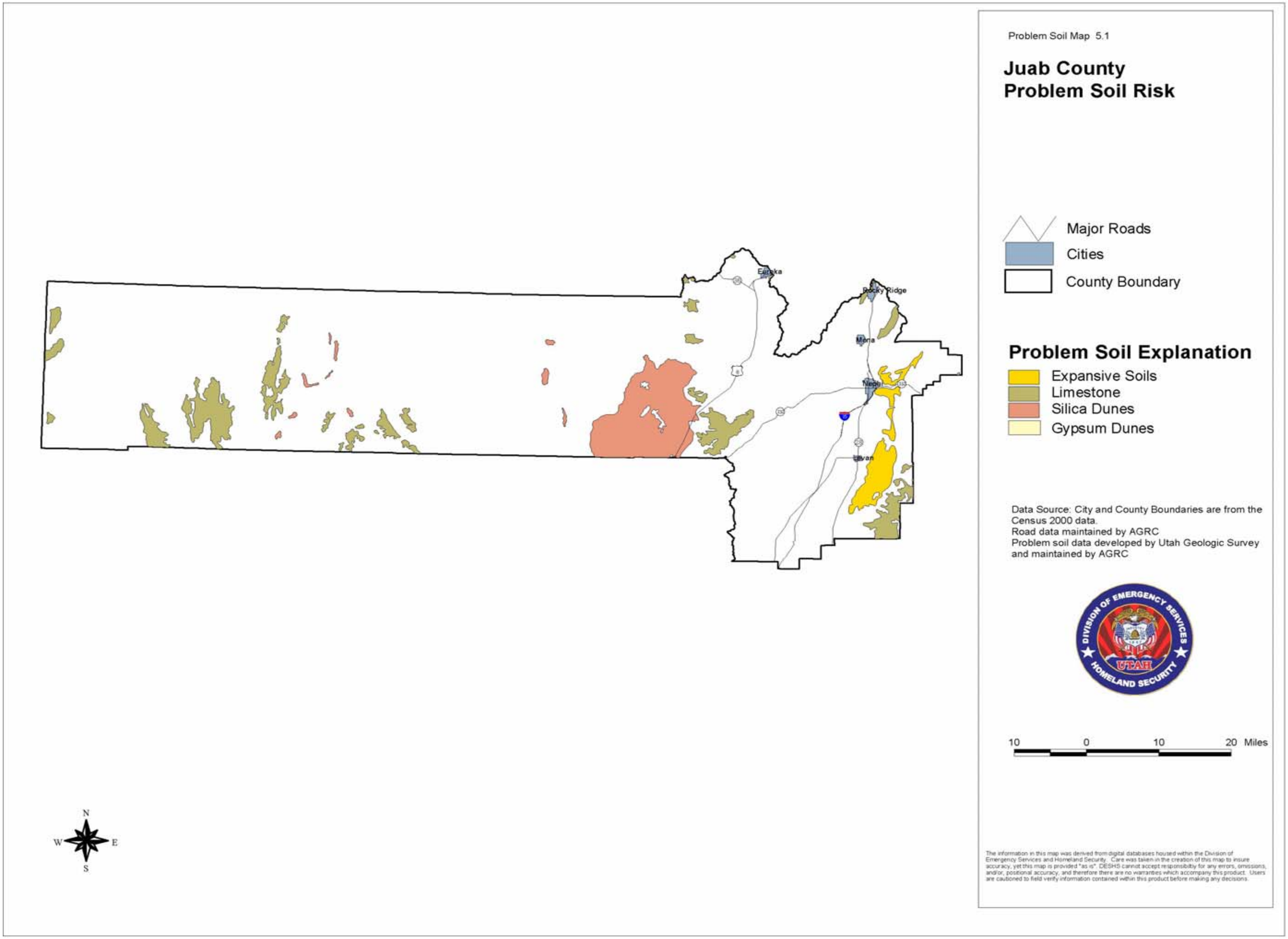
Problem Soil Map 5.1
Juab County
Problem Soil Risk
Major Roads
Cities
County Boundary
Problem Soil Explanation
Expansive Soils
Limestone
Silica Dunes
Gypsum Dunes
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Problem soil data developed by Utah Geologic Survey and maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Eureka
Rocky Ridge
Mona
Nephi
Levan
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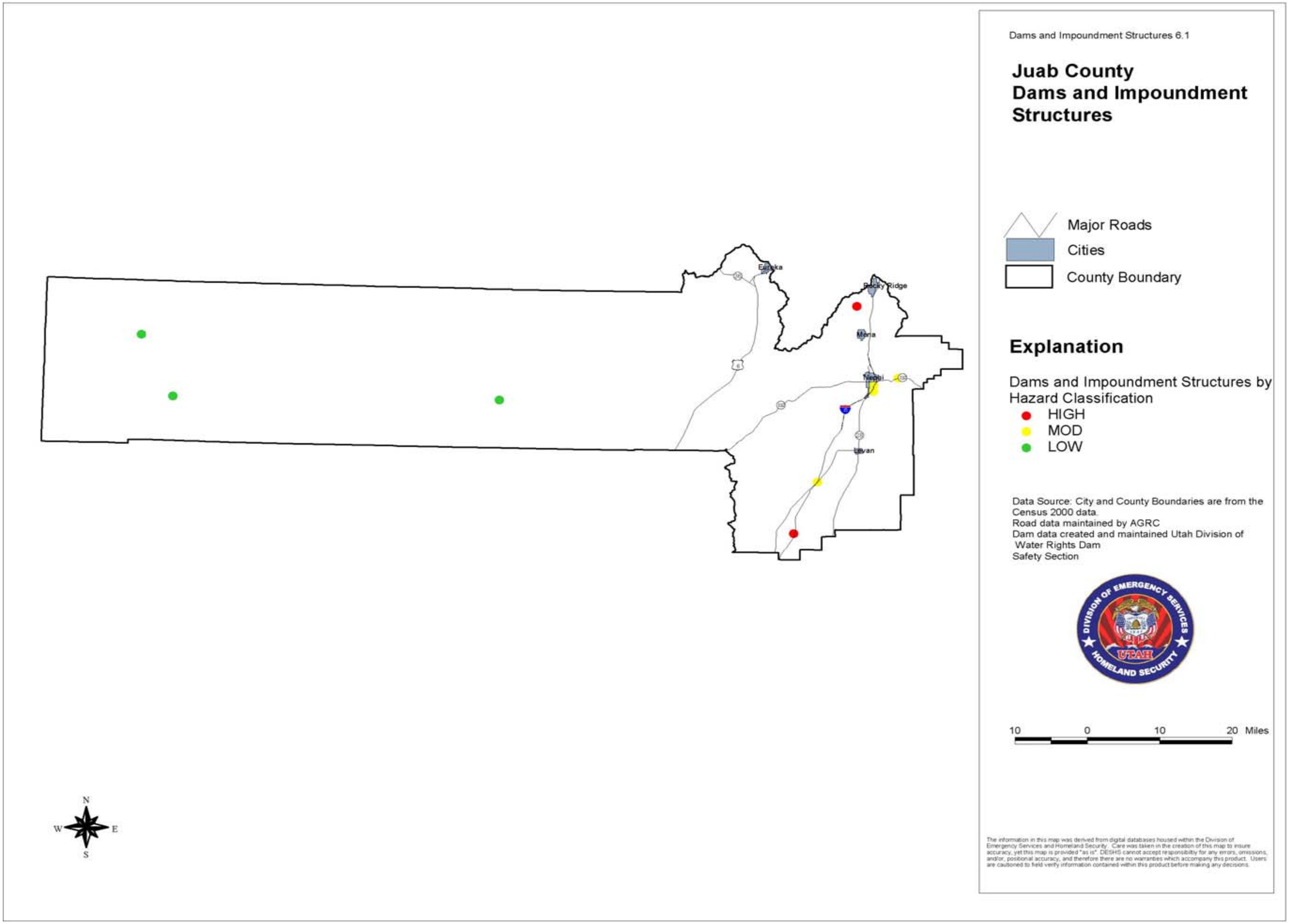
Dams and Impoundment Structures 6.1
Juab County
Dams and Impoundment
Structures
Major Roads
Cities
County Boundary
Explanation
Dams and Impoundment Structures by
Hazard Classification
HIGH
MOD
LOW
Data Source: City and County Boundaries are from the
Census 2000 data.
Road data maintained by AGRC
Dam data created and maintained Utah Division of
Water Rights Dam
Safety Section
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10
0
10
20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Eureka
Rocky Ridge
Mona
Nephi
Levan
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S

MITIGATION CAPABILITIES OF CERTAIN COUNTY AGENCIES

A. Juab County Emergency Management

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Coordinate emergency planning and response activities with numerous county agencies. Planning encompasses preparedness, response, recovery, and mitigation.

    b. Responsible for everyday operations of the county's Emergency Operations Center and 911 communications.

    c. Update and exercise emergency operations and mitigation plans.

    d. Coordinate state sponsored training for county agencies including; law enforcement, public health, social services, fire departments, emergency medical services, etc.

    e. Coordinate the county's Tier Two reporting. (Hazardous materials)

    f. Public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.

    g. Work with schools and local businesses to help create site-specific hazard response plans and present in-service education to local business employees.

    h. Responsible for timely and effective public information releases during emergency situations.

    i. During a disaster declaration, emergency management has all county resources at their disposal including manpower, communications, and equipment.

    j. Have verbal mutual aid agreements with Millard, Piute, Sanpete, Sevier, and Wayne County Emergency Management Agencies for necessary resources during a disaster situation.

    k. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.

l. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. In coordination with the Six County Association of Governments, assist with applications for federal and state funding such as the Hazard Mitigation Grant Program.

   b. Involved with inspecting hazardous material storage sites and fulfilling Tier Two reporting requirements.

   c. Participate in dam inspections with the Army Corp of Engineers.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: Juab County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include:

   Juab County Commissioners, Juab County Road Department, Juab County Sheriff Department, and various other law enforcement, fire, communication, and emergency medical agencies.

   b. <u>Non-local Agencies</u>: Juab County Emergency Management coordinates with numerous state and federal agencies. These agencies include the Utah Division of Emergency Services and Homeland Security, Utah Highway Patrol, State Health Department, Department of Transportation, and Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   a. Provide listings of eligible mitigation projects so counties can be prepared when funds become available.

   b. Warning systems and sirens are outdated and inadequate. At this time, funding is not available for improvements.

   c. Juab County is constantly striving to improve planning and exercise activities and response capabilities. However, with the county growing and becoming more industrial, the threat of potential hazards increases, which increases the need for resources, training, and awareness.

d. County needs to add natural hazard mitigation to the General Plan and to the zoning and subdivision ordinances. Based on funding, Six County Planning Staff will work with the county to update the General Plan and the zoning ordinances to reflect natural hazard mitigation. Existing zoning requirements for flood plain management need to be enforced.

B. <u>Juab County Highway Department</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Design bridges, culverts, and overflow sections. The County Highway Department follows a very detailed list of design standards for all projects within the county.

   b. Continually working with the Department of Transportation on various projects since the DOT dispenses federal funding. While the DOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:

   a. Responsible for and have authority to regulate and inspect all projects completed within the county.

   b. All projects funded by the state or federal government are designed by a consulting engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the consulting engineering company and is overseen by the county to ensure standards are met. Many county projects are designed with in-house expertise and engineers are consulted if problems arise.

   c. All funding in one-way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: The County Highway Department has little interaction with other county agencies concerning roads and bridges. They do, however, coordinate with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States

Attorney's Office. The land values are usually developed by the Tax Equalization Office and approved by the County Commission.

b. Non-local Agencies: The County Highway Department coordinates with various State and Federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the Utah Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the Utah Historical Society.

4. General recommendations/Emergency Management concerns:

a. Juab County Highway Department should assist local government with floodplain management and water development permitting.

C. Central Utah Public Health

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Central Utah Public Health (CUPH) will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.

b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.

c. Programs include; waste water treatment, water pollution, public health nursing, immunization programs, solid waste regulation, food establishment inspections, air quality, and vector control.

2. Responsibility and authority in the regulating, inspecting or funding of projects.

a. CUPH Health is a unit of state government that operates through agreements or Memorandums of Understanding with the Utah Department of Health to enforce state public health statutes within the Six County district. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with other government agencies:

    a. Local Agencies: Within the scope of public health, CUPH coordinates with the following local agencies; Juab County Emergency Management, local law enforcement agencies (city and county), local school boards, and planning and zoning agencies.

    b. Non-local Agencies: Within the scope of public health, CUPH coordinates with the following agencies; Utah Department of Health and state and federal law enforcement agencies.

4. General recommendations/Emergency Management concerns:

    a. Public Health is normally under funded and understaffed at all levels of government. Should CUPH be called upon for expertise at a time of emergency or disaster, it normally does not have instrumentation for site level determinations of any kind without support from other agencies.

    b. Public health agencies should be included in equipment storage; e.g., FEMA equipment "stored" and used at public health agencies, rather than being stored at a warehouse.

D. Juab County Sheriff's Department

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Responsible for law enforcement and criminal investigation in unincorporated areas of the county and in smaller towns that do not have police departments.

    b. Provide standard law enforcement manpower and equipment.

    c. In disaster situations, provide; warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

    d. Provide public awareness and educational programs. (911 education, safe kids program, etc.)

    e. Have verbal mutual aid agreements with all surrounding counties and the Utah State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Within the scope of law enforcement, the Juab County Sheriff's Department coordinates with various local agencies. These agencies include Juab County Emergency Management and various local police departments.

   b. Non-local Agencies: Juab County Sheriff's Department coordinates with appropriate state and federal agencies including; Utah Highway Patrol, Utah Attorney Generals Office, Bureau of Criminal Identification, Utah Department of Transportation, and Federal Bureau of Investigation.

4. General recommendations/Emergency Management concerns:

   a. None

E. Juab Fire District

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.

   b. Respond to accidents in order to provide rescue assistance.

   c. Assist Emergency Medical Services in providing emergency assistance to sick and injured. (First responders)

   d. Provide standard firefighting manpower and equipment.

   e. Respond to spills and releases of hazardous materials and assist in mitigating the detrimental human and environmental effects of these occurrences.

   f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.

g. Provide training for department members that will enable them to effectively and efficiently carry out their respective duties and responsibilities.

h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.

i. Assist in enforcement of city fire ordinances.

j. Fire investigation.

k. Provide assistance to other jurisdictions, as department resources and commitments allow.

l. Inspections and preplanning within the fire district to reduce hazards and aid in fire prevention.

m. Assist with the county's tier two reporting. (Hazardous materials storage sites)

n. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies:</u> In efforts to decrease vulnerability to hazards, the Juab Fire District coordinates with various local agencies. These agencies include Juab County Emergency Management, Nephi City Police Department, Juab County Sheriff's Department, Eureka Fire Department, Levan Fire Department, Mona Fire Department, Rocky Ridge Fire Department, local Public Works, and local Emergency Medical Services.

   b. <u>Non-local Agencies:</u> Utah State Fire Marshal and the Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   Our district has seen an increase in number and variety of calls. As first responders, we have to train and equip our fire departments for various situations that may arise, such as: vehicle extrication, various types of hazardous materials, and many other types of responses. Each added type of response increases the need for equipment and the time our volunteers need to spend in training. With the recent decrease in population in our district, volunteer retention and recruitment is also a concern.

a. Seek funding outside of the district for additional equipment that will improve the effectiveness of our responses as well as increase the margin of safety for our volunteers.

b. Explore training options to cover the expanding variety of responses in our district.

c. Look into recruitment and retention programs that will work in our district.

F. Utah State University Extension Service

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. The Utah State University Extension Service provides practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.

   b. County Extension Agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.

   c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage clientele.

   d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.

   e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.

f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.

g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. Authority is at federal level.

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Juab County Emergency Management and Central Utah Public Health.

   b. Non-local Agencies: Utah State University, Utah State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/Emergency Management concerns:

   a. None.

G. Nephi City Police Department

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Provide general law enforcement services that are designed to efficiently prevent crime and promote concepts of community policing. These services include traffic control, criminal and accident investigations, neighborhood policing, animal control, and neighborhood and business watches.

   b. Provide standard law enforcement manpower and equipment.

   c. Provide public awareness and training programs including: Drug Abuse Resistance Education (DARE), juvenile diversion programs, Crime Stoppers, gang awareness, Citizen Police Academy, Jr. Police Academy, and a ride along program.

   d. In disaster situations, provide: warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

e. Involved in the county's local Tier Two reporting (Hazardous Materials).

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. Provide input to and enforce city ordinances regarding public safety.

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Within the scope of law enforcement, the Nephi City Police Department coordinates with various local agencies. These agencies include: Juab County Emergency Management, Juab County Sheriff's Department, and the Juab Fire District.

   b. Non-local Agencies: Nephi City Police Department coordinates with appropriate state and federal agencies including: Utah Highway Patrol, Federal Bureau of Investigation (FBI), Bureau of Alcohol, Tobacco, and Firearms (ATF), and Federal Emergency Management Agency (FEMA).

4. General recommendations/Emergency Management concerns:

   a. Explore funding alternatives to upgrade outdated and inadequate warning systems (sirens). At this time, federal funding is not available.

   b. Intensify awareness and training in regard to civil disorder and terrorism incidents.

OTHER AGENCY RESOURCES

A. Mitigation and risk reduction:

1. Juab County Social Services: Temporary assistance to needy families, food stamps, medically needy programs, adult services, homeless assistance, family planning, etc.

2. Army Corps of Engineers: Water and dam management within the county. Provide technical expertise, sandbags, and heavy equipment.

3. Utah Highway Patrol: Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

4. State Fire Marshal: Hazmat route utilization; hazmat technical assistance; situation and damage assessment.

5. Forestry, Fire & State Lands: Debris removal from recreational facilities; technical assistance; situation and damage assessment.
6. Utah Division of Wildlife Resources: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

7. State Radio Communications: Exercise readiness of warning systems and communication support.

8. Department of Agriculture: Assists with situation and damage assessment; coordination with USDA; hazmat technical assistance; state land use program.

9. Department of Workforce Services: Situation assessment and administration of disaster unemployment assistance programs.

10. Human Services: Insure liaison with private relief agencies for disaster victims.

11. State Historical Society: Project screening and situation assessment.

Annex 3 -- Millard County

In order to effectively identify and mitigate natural hazards in Millard County, a Pre-Disaster Mitigation Planning Team representing Emergency Management and each jurisdiction in the county was created. Table 1 names the members of this team. Input from the team was used in organizing hazard mitigation strategies outlined in *Annex 8* and *Appendix Q* of this plan.

Table 1: Millard County Pre-Disaster Mitigation Planning Team

Name	Representing:
Forrest Roper, Emer. Mgr.	Millard County
John Cooper, Commissioner	Millard County
Craig Greathouse, Commissioner	Millard County
Daren Smith, Commissioner	Millard County
Gayle Bunker, Mayor	Delta
V.B. “Sam” Starley, Mayor	Fillmore
Donald Brown, Mayor	Hinckley
Brent Bennett, Mayor	Holden
Terry Higgs, Mayor	Kanosh
Jim Rasch, Mayor	Leamington
Jese Ruiz, Mayor	Lynndyl
Jim Talbot, Mayor	Meadow
Winston Nielson, Mayor	Oak City
Burtis Quarnberg, Mayor	Scipio
Kelly Allen	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Past Hazard Events in Millard County

Understanding the past is often the key to discovering what the future holds; this is especially true when planning for natural disasters. The fact that cities within Millard County have experienced, for example, flooding in the past means flooding can occur in the future. While over time some of this has been mitigated for the low frequency of occurrence often results in hazards with little or no mitigation. Table 2 provides a brief history of Millard County natural disasters. This table includes only sizable events found during our research, and may not represent the total history.

Table 2: Natural Hazard History

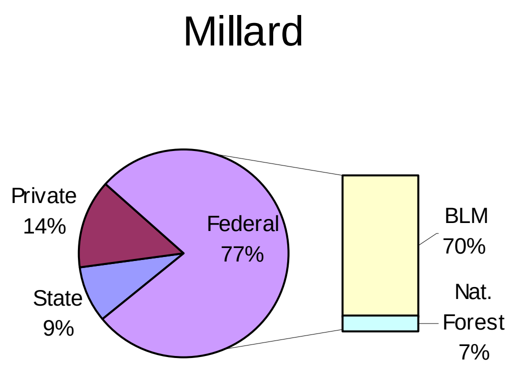
Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Dam Failure (Corn Creek)	Spring, 1983	Near Kanosh	Unknown	Unknown
Dam Failure (DMAD)	June 23, 1983	Near Delta	Unknown	16,000 acre feet of water inundated the town of Deseret killing one person attempting to cross the flood on a pipe.
Flood	1896	Meadow	Unknown	Unknown
Flood	1934	Meadow	Unknown	Unknown
Flood	1938	Meadow	Unknown	Unknown
Flood	1940	Meadow	Unknown	Unknown
Flood	August 4-6, 1945	Oak City	Homes and fields in Oak City.	Dry Creek and Oak Creek drainages.
Flood	July 18, 1951	Scipio	Damage to farms, crops, and residential areas.	$25,000.00 in damages.
Flood	August 25, 1958	Scipio	Damage to farmlands and Highway 63.	$3,000.00 in damages.
Flood	July 31, 1961	Fillmore	City homes and water lines	Chalk Creek
Flood Presidential	1983	Fillmore, Deseret, and Scipio	Loss of over 140 homes, rail lines, sewer lines, roads, etc.	Chalk Creek, Oak Creek, and the Sevier River; $1,000,000 in public assistance.
Flood Presidential	1984	County wide	All sectors	Public assistance total $492,204.
Flood	August 2000	Holden	Damage to 4 structures and municipal roadways.	Unknown

Hazards	**Date**	**Location**	**Critical Facility or Area Impacted**	**Comments**
Earthquake	January 16, 1968	Scipio	Unknown	Richter Magnitude Scale 3.9; earthquake swarm in the area.
Severe Weather	August 4, 1916	Unknown	No damage	Tornado
Severe Weather	May 3, 1982	North of Milford	No Damage	Tornado
Severe Weather	June 7, 1989	Delta	No Damage	Tornado
Severe Weather	May 28, 1996	McCornick	No Damage	Tornado

(Source: History of Millard County, Utah State Historical Society.)

Development Trends
Approximately 618,409 acres or 14% of the total land area in Millard County is privately held and outside the incorporated areas is mostly vacant. The other 86% is owned by the state or federal governments and aside from extractive industry is beyond the reach of development. Since land ownership determines how and where development proceeds, Figure 1 helps explain Millard County's development trends.

Figure 1: Land Ownership



The vast majority of landslides, debris flows and wildfires occur on these public lands with virtually no impact on development. Of the privately held land, most is not developable due to a lack of water. Other limitations include steepness of the terrain and accessibility. Currently, Millard County zoning ordinances specify water access and a ½ acre minimum per house. There is still plenty of infill within city limits that can be utilized for safe development without developing in unincorporated, sparsely populated, or hazardous areas. Millard County requires UBC on all new or proposed buildings. New subdivisions require a grading and drainage plan to mitigate any flooding, which may occur. Most of the development is occurring along the relatively safe I-15 corridor and along US 6 by Delta since this is where most of the private lands are located. The Intermountain Power Plant (IPP) in Delta is considering in extending its life for another twenty years, by revamping the plant's infrastructure. The power plant is one of Millard County's major developments in the 1980's and will continue to remain a primary project into the 21st Century.

Historically, Fillmore was the capitol of the Territory of Utah until 1856 when it was moved to the more populated Salt Lake City. Delta had its start in 1906 further west along the Sevier River from agricultural settlements from the 1850s. Both Fillmore and Delta depended greatly on agriculture and still do today. Transportation development had its beginnings in the original wagon trails, which brought the pioneers to this area. The Union Pacific Railroad came to Millard County passing near Delta. US 6 and State Route 257 roughly follow this route. I-15 follows the old Highway 91, which connected Salt Lake City to St. George. Future development will likely occur along I-15 and US 6 near Delta due to the privately held lands in this area. Except for lands adjacent to the Sevier and Beaver Rivers and their tributaries, this area is relatively safe from natural hazards.

1. Earthquake

Table 3: FEMA Hazard Profile for Earthquake in Millard County

Frequency	Possible
Severity	Catastrophic
Location	Ground shaking will be felt throughout the entire county if a large earthquake were to occur. Surface fault rupture could be expected in areas of known historic fault movements. Liquefaction is expected in areas of high to moderate liquefaction potential, which covers a vast portion of Millard County.
Seasonal Pattern	None
Duration	Actual ground shaking will be under one minute yet after shocks may occur for weeks after.
Speed of Onset	No warning

Description of Location and Extent

The Six County region's earthquake threat from the Intermountain Seismic Belt and other crustal rock strain release areas is high; although there is limited risk to population due to the large areas of undeveloped lands those living in the region are at an elevated risk. During historic time the largest recorded earthquake in Millard County has not reached above 3.9 on the Richter magnitude scale, yet geologic investigation has determined much larger events have happened in the recent geologic past and could happen in the future. These events are associated with numerous faults, which exhibit signs of prior movement during the quaternary time period or the last 1.6 million years. These faults are listed in Table 4 (also, see Maps 1.1 and 1.2 starting on p.17 of this Annex).

Table 4: Fault Line Movement

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Snake Valley (south end) faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Snake Valley (south end) faults	Late Quaternary (<130,000 years)	< 0.2 mm/yr	Simple
Snake Valley faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Snake Valley faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Foote Range fault	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
House Range (west side) fault	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Swasey Mountain (east side) faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Drum Mountains fault zone	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Crater Bench faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Cricket Mountains (north end) faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Deseret faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Clear Lake fault zone	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Suspected
Sugarville area faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Pavant faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Pavant faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Little Valley faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Scipio Valley faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Scipio faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Scipio faults	Late Quaternary (<130,000 years)	< 0.2 mm/yr	Simple
Scipio faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Pavant Range fault	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Maple Grove faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Maple Grove faults	Late Quaternary (<130,000 years)	< 0.2 mm/yr	Simple
Maple Grove faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Japanese and Cal Valleys faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Japanese and Cal Valleys faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Little Rough Range faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
North of Wah Wah Mountains faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Cricket Mountains (west side) fault	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Black Rock area faults	Late Quaternary (<130,000 years)	< 0.2 mm/yr	Simple
Black Rock area faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Faults of Cove Creek Dome	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Beaver Ridge faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Beaver Ridge faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Tabernacle faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Meadow-Hatton area faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
White Sage Flat faults	Late Quaternary (<130,000 years)	< 0.2 mm/yr	Simple
White Sage Flat faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Red Canyon fault scarps	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Mountain Home Range (west side) faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Wah Wah Mountains faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
San Francisco Mountains (west side) fault	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
San Francisco Mountains (west side) fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Mineral Mountains (northeast side) fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Cove Fort fault zone	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Suspected

HAZUS-MH Vulnerability Assessment
HAZUS-MH was used to determine vulnerability to earthquakes in the Six County planning area. Tables 5-9 are a summary of results from the HAZUS MH model. Damage and loss estimates are based on a 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete Millard County HAZUS MH run is available in *Appendix O.*

Number of people
Whether an earthquake occurs at night, during the day, or during a commute plays a significant role in estimating the number of casualties as outlined in Table 5.

Table 5: Casualties

Casualties	Nighttime –Minor	29
	Nighttime –Major	8
	Nighttime -Fatalities	2
	Daytime –Minor	61
	Daytime –Major	19
	Daytime- Fatalities	5
	Commute –Minor	24
	Commute –Major	7
	Commute-Fatalities	2

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 6 lists the number buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 6: Building Damage by Count with Moderate to Complete Damage

Category	Number of Structures	Value of Structures in Millions
Residential	1,034	25.7
Commercial	25	7.9
Industrial	8	2.1
Other	9	2.9
Totals	1,076	38.6

Infrastructure Types and Amounts
Table 7 shows which critical facilities will receive damage and how much damage will result.

Table 7: Critical facilities

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	2	0	0	0
Schools	9	0	0	0
EOCs	0	0	0	0
Police Stations	0	0	0	0
Fire Stations	4	0	0	0

Debris Removal –Table 8 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour.
A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of one yard.

Table 8: Debris Generated (millions of tons)/Loads to Remove Debris

Debris Generated	0.04
Loads (25 tons per load)	2,000

Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 9 provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 9: Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	1
People Displaced	0
Value Exposed (mill. $)	0

2. Floods

Table 10: FEMA Hazard Profile for Floods in Millard County

Frequency	Likely
Severity	Limited
Location	Flooding would occur in and along flood plains.
Seasonal Pattern	Millard County's main flooding threat is from snowmelt runoff during spring months.
Duration	The type of event determines the duration of flooding; flooding due to summer thunderstorms can last a couple of hours whereas flooding due to spring runoff can last weeks.
Speed of Onset	Six to twelve hours.

Description of Location and Extent
Based on the flooding which occurred during the spring of 1983 and 1984 both as a result of rapid snow melt events, experience would suggest these events would appear to be a greater hazard than cloudburst storms. Yet serious hazards could result from either storm. The entire county can experience flooding near the low-lying areas along streams and around lakes. Flooding is of particular concern along the Sevier River and its tributaries, Oak and Dry Creek, Corn Creek, Pine Creek, Chalk Creek, and Meadow Creek. As state population increases development also increases. This increase has resulted in somewhat of a new hazard canal failure. The following Canals in Millard County cross through populated areas: Central Utah and Abraham Canal.

Description of type
Precipitation in Millard County originates from two major sources. Moisture laden polar pacific air entering the area from the west or northwest during the winter produces large general storms, which most often result in heavy snowfall in the upper elevations and either snowfall or moderate intensity rainfall in the lower elevations.

The second major source of precipitation in the area arises from tropical air masses entering from the south and southwest out of the Gulf of Mexico during the summer months. Often wrongly referred to as monsoons these air masses cause high intensity convective cloudburst storms, which are augmented by the orthographic lifting which occurs as the air mass passes over neighboring mountains.

Precipitation from these two types of storms can produce flash floods, snowmelt floods, post wildfire/damaged watershed floods, and severe winter weather.

Note on Vulnerability Assessment
At this time, data was insufficient to conduct a risk analysis for flood events in Millard County. Flood Insurance Studies were study were applicable to aid in determining risk. However, the current mapping projects being led by the county and state will result in better data that will assist in understanding risk. As part of its efforts to mitigate hazards and protect lives and property from the devastating effects of natural disasters, FEMA aims to provide individuals, businesses, and communities with information and tools to work proactively to mitigate hazards and prevent losses resulting from disasters. One of these tools is the new HAZUS MH flood model. Unfortunately at the current time this model does not work well enough to complete loss numbers for each jurisdiction in the county.

The U.S. Army Corps of Engineers wrote a Flood Hazard Identification Study (see *Appendix N)* which is included in the flood mitigation goals found in Annex 8 and *Appendix Q* of this plan. This study looks predominately at jurisdictions, which are unmapped or mapped as D zones by the National Flood Insurance Program.

3. Landslides

Table 11: FEMA Hazard Profile for Landslides in Millard County

Frequency	Likely
Severity	Negligible
Location	Mass wasting in Millard County is located predominately along the canyons east of the Pahvant Valley (see Map 3.1 on p.19 of this Annex).
Seasonal Pattern	Landslides most often occur within Millard County during spring months with higher than normal amounts of precipitation.
Duration	Several months
Speed of Onset	No warning

Description of Location and Extent
The map "Millard County Landslide Map 3.1" shows the locations of potentially active landslides, and identifies historical landslides and their locations. Landslides are generally located in well-defined, localized areas, but when they occur is usually unpredictable. The impact of a landslide can be countywide.

GIS analysis, using best available data, found no active landslides within or abutting, current boundaries of incorporated municipalities within Millard County. However, the extent and cost of damage to roads and electric infrastructure are shown in Tables 12 and 13, respectively.

Table 12: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	15.7	37,891,950

Table data represents total length of roads, which overlay historically active landslides.

Railroads
This vulnerability analysis using best available data found no railroad track at risk in Millard County.

Table 13: Electric Infrastructure

Name	Description	Estimated Cost
KV-46 lines	1.7 Miles	82,077
KV-138 Lines	2 Miles	96,561

4. Wildfire Risk

Table 14: FEMA Hazard Profile for Wildfire in Millard County

Frequency	Likely
Severity	High in the Wildland Urban Interface
Location	Entire county except cultivated grounds.
Seasonal Pattern	Most wildfires affecting Millard County occur during mid to late summer months (fire season).
Duration	The amount of time needed to contain a wildfire depends on a variety of uncontrollable variables such as: wind speed, relative humidity, type, and moisture content of fuel, weather, and topography. Thus containment time varies for each fire.
Speed of Onset	0 to 6 hours is the minimum amount of time given to homeowners in order to evacuate.

Description of Location and Extent
The Division of Emergency Services and Homeland Security augmented a statewide wildfire database to represent wildfire vulnerability into five categories: Extreme, High, Medium, Low, and Very Low. These ratings cover all of Millard County and are based on the type and density of vegetation in each area. Additional factors influencing wildland fires such as weather conditions, wind speed and direction are not considered in this risk assessment.

No land surrounding or abutting the jurisdictions within Millard County received wildfire classifications of extreme or high.

See Map 4.1 on p. 20 of this Annex for a visual display of location and severity of wildfire risk in Millard County. Tables 15-18 show the number of acres and households at different levels of wildfire risk in Millard County.

Table 15: Wildfire Acres

County Name	Acres of Extreme	Acres of High	Acres of Moderate	Acres of Low/Very Low
Millard	None	105,081	307,482	3,956,751

Table 16: Unincorporated County

County	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Millard	None/0	109/6,278,400	317/18,259,200

Table 17: Incorporated Millard County*

City Name	Acres of High	Acres of Moderate
Delta	None	87
Fillmore	None	504
Hinckley	None	34
Holden	None	None
Kanosh	None	None
Leamington	None	180
Lynndyl	None	None
Meadow	None	None
Oak City	None	20
Scipio	None	21

*No Extreme wildfire risk within Millard County

Table 18: Structures in Wildfire Area

City Name	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Delta	None/0	None/0	47/2,707,200
Fillmore	None/0	None/0	112/6,451,200
Hinckley	None/0	None/0	2/115,200
Holden	None/0	None/0	None/0
Kanosh	None/0	None/0	None/0
Leamington	None/0	None/0	13/748,800
Lynndyl	None/0	None/0	None/0
Meadow	None/0	None/0	None/0
Oak City	None/0	None/0	8/460,800
Scipio	None/0	None/0	5/288,000

*Excludes content value, which would result in an increase of 50% to the values listed.

Tables 19-21 show extent and cost of wildfire risk to roads, railroads, and electric infrastructure in Millard County.

Table 19: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	1,226	2,958,951,000
State Route 99	.37	892,995
State Route 100	.05	120,675
State Route 125	19	45,856,500
State Route 132	5.7	13,756,950
US Highway 6	3.3	7,964,550
US Highway 50	13	31,375,500
Interstate I-15	61.6	147,464,850
Interstate I-70	7.5	18,101,250

Table data includes road lengths within areas determined to have an extreme, high, or moderate risk to wildfire as determined by the Utah Statewide Fire Risk Assessment.

Table 20: Railroads

Railroad	Miles	Estimated Cost
Railroad	3.6	8,550,000

Table 21: Electric Infrastructure

Name	Description	Estimated Cost
North Fields	115 KV	10,000,000
Fillmore SW. RK	115 KV	10,000,000
KV-46 lines	33.1 Miles	1,599,000
KV-138 Lines	3.6 Miles	174,000
KV-230 Lines	21.7 Miles	1,047,000

5. Problem Soils

Table 22: FEMA Hazard Profile for Problem Soils in Millard County

Frequency	Likely
Severity	Negligible (10-25% of jurisdiction affected)
Location	Typically occur at the valley's boundary with the foothills.
Seasonal Pattern	None
Duration	Problems associated with soils last for long periods of time.
Speed of Onset	More than 24 hour warning time.

Description of Location and Extent
The areas of greatest threat are west of Hinckley, Leamington, Lynndyl, and Oak City where silica dunes are encroaching on the municipalities. See Map 5.1 on p.21 of this Annex.

6. Dam Failure

Table 23: FEMA Hazard Profile for Dam Failure in Millard County

Frequency	Possible
Severity	Limited
Location	Would occur downhill from existing dams.
Seasonal Pattern	None
Duration	Depends on dam and type of break; Could be a wall of water which passes through in a few hours, or a slower break which could last for weeks.
Speed of Onset	6 to 12 hours.

Description of Location and Extent
Of the dams located in Millard County only three dam are considered a high hazard. A high hazard is defined as a possibility of life being lost due to dam failure. All dams, regardless of rating should be monitored. It should be noted that dam safety hazard classifications are based upon the consequences of dam failure. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure.

The areas of greatest danger to dam failure are west of Corn Creek (near Kanosh), Gunnison Bend (near Hinckley), and DMAD (near Delta) dams. See Map 6.1 on p.22 of this Annex.

The high risk dams in Millard County are the following (see Table 24):

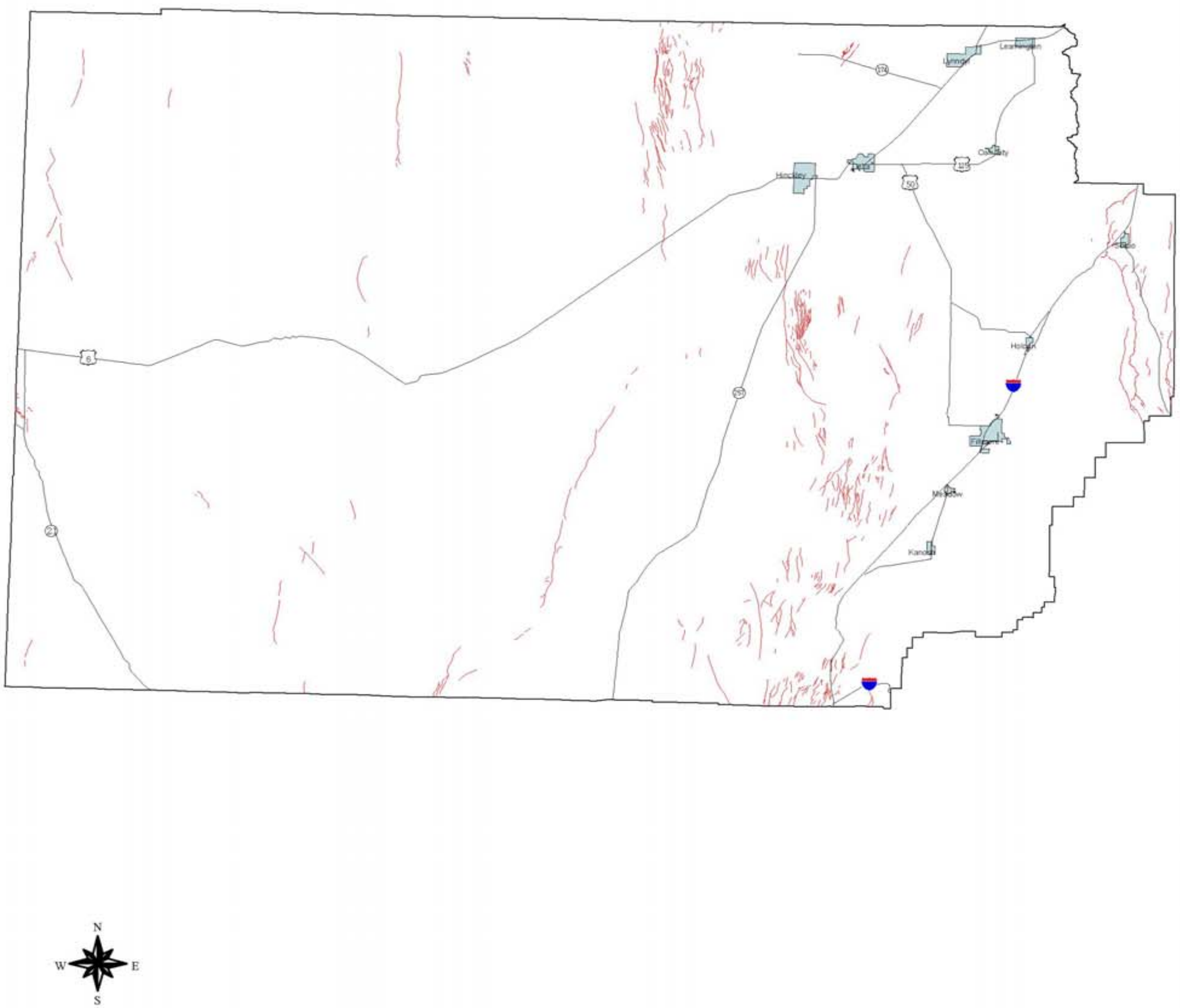
- Corn Creek
- Gunnison Bend
- DMAD

Table 24: High Risk Dams

Name	Year Completed	Type	Storage Acre Feet	Breach Flow cfs
Corn Creek	1985	Earth Fill	89	5000
DMAD	1959	Earth Fill	7500	12000
Gunnison Bend	1895	Earth Fill	5000	5000

Quaternary Faults 1.1

Millard County Quaternary Faults



Major Roads

Cities

County Boundary

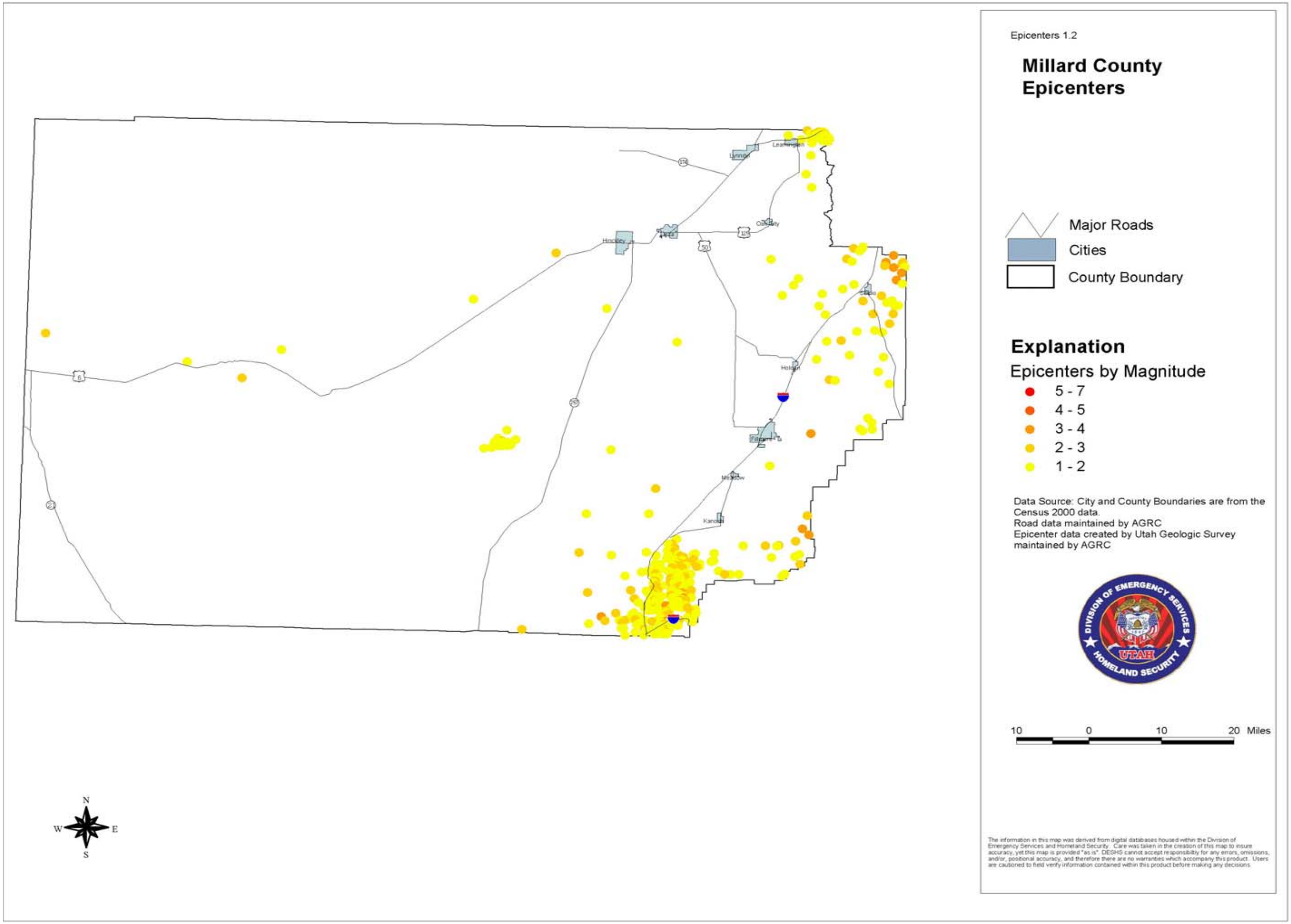
Explanation

Quaternary Faults

Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Quaternary Faults data from Utah Geologic Survey

10 0 10 20 Miles

The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibiltiy for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.


Epicenters 1.2
Millard County Epicenters
Major Roads
Cities
County Boundary
Explanation
Epicenters by Magnitude
5 - 7
4 - 5
3 - 4
2 - 3
1 - 2
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Epicenter data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
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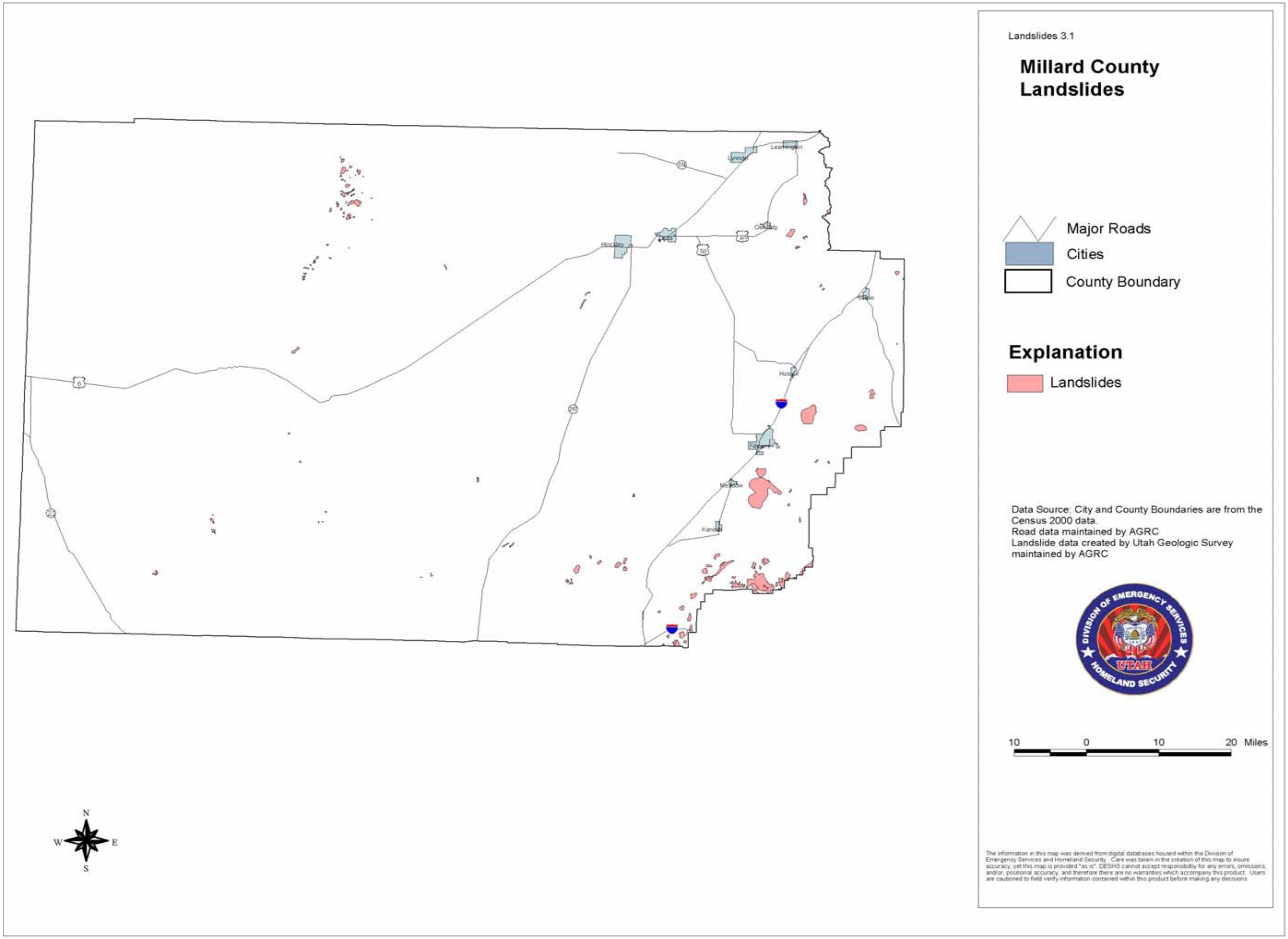

Landslides 3.1
Millard County Landslides
Major Roads
Cities
County Boundary
Explanation
Landslides
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Landslide data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
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The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
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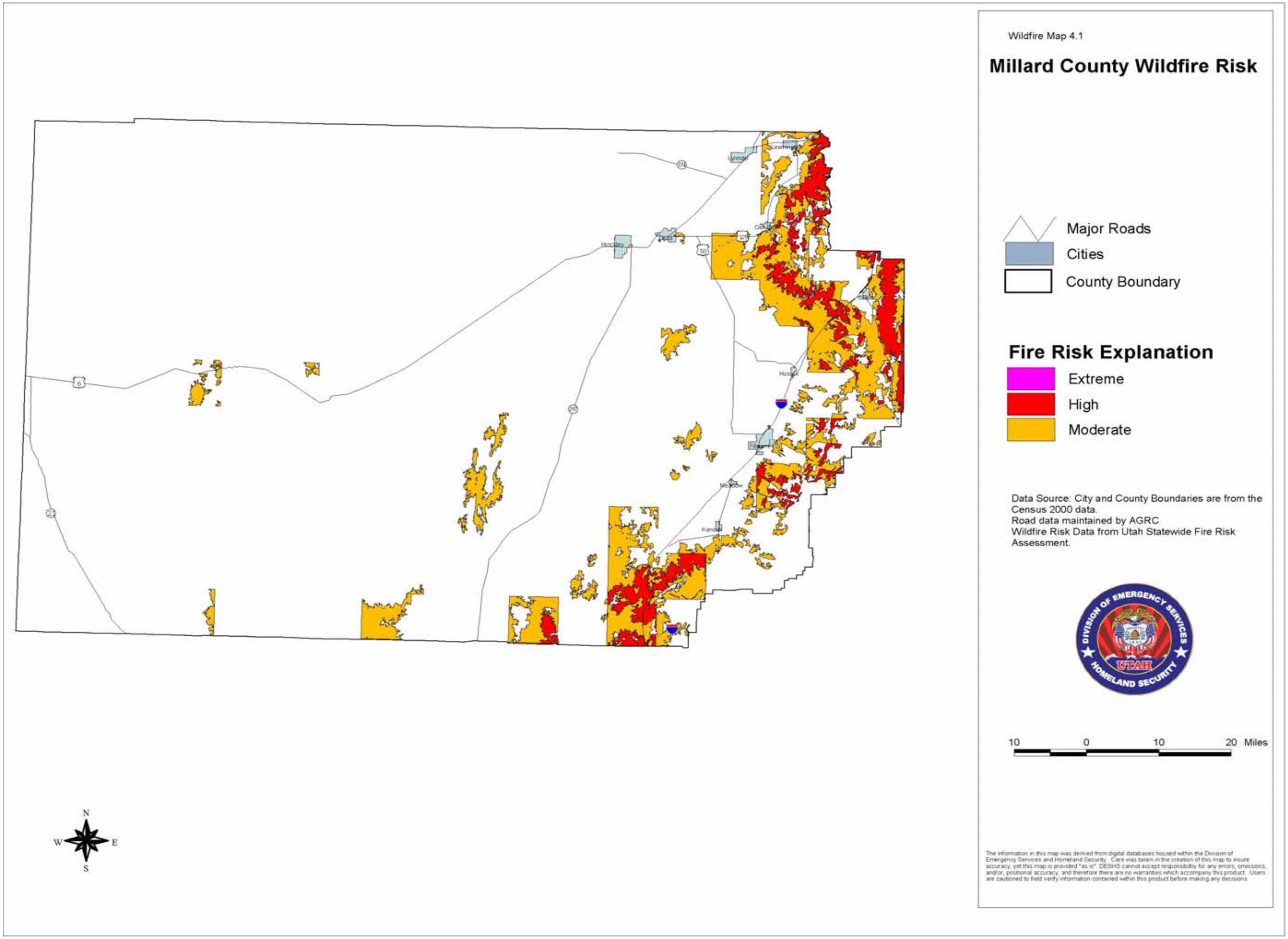
Wildfire Map 4.1
Millard County Wildfire Risk
Major Roads
Cities
County Boundary
Fire Risk Explanation
Extreme
High
Moderate
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Wildfire Risk Data from Utah Statewide Fire Risk Assessment.
DIVISION OF EMERGENCY SERVICES
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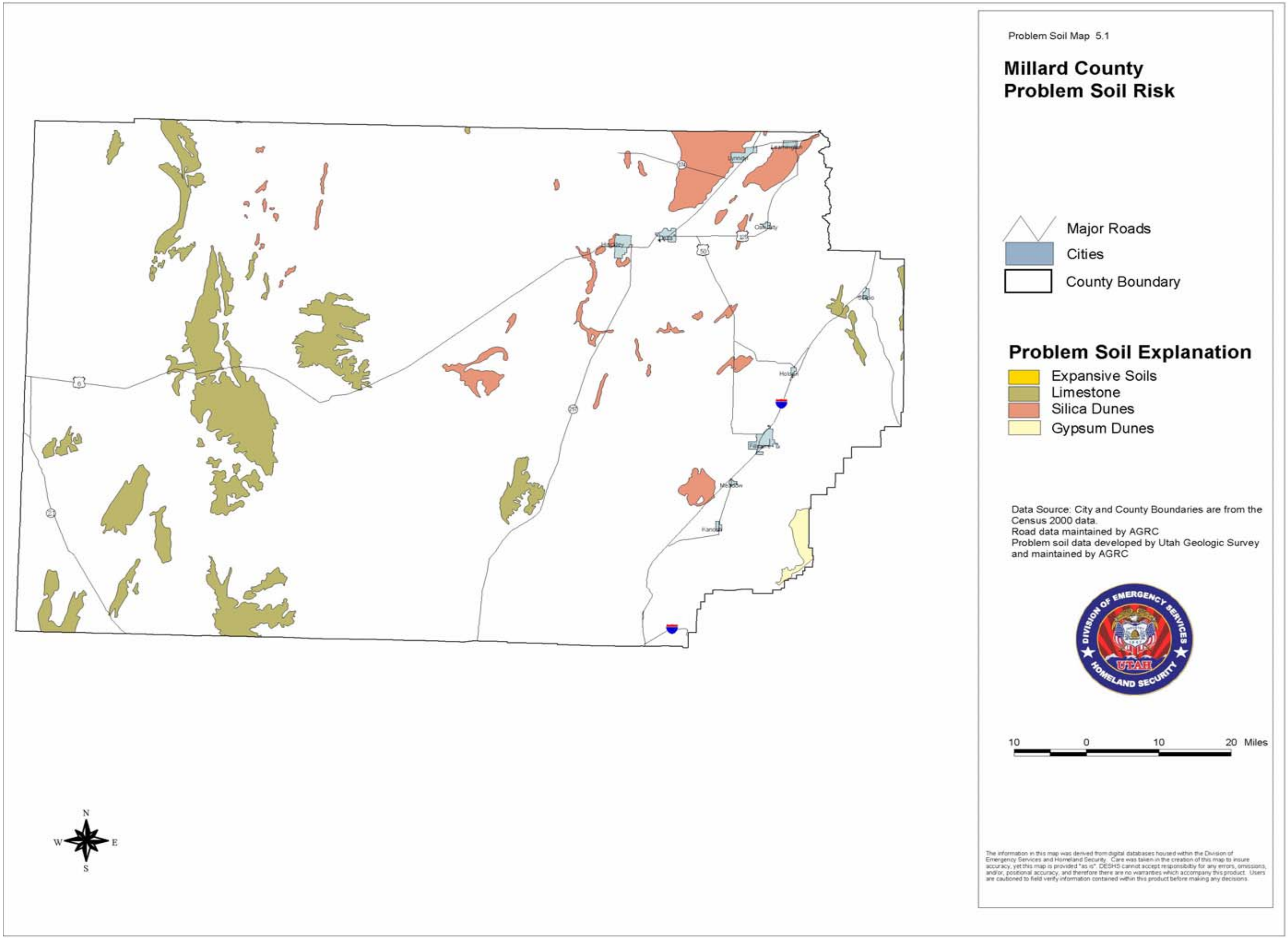
Problem Soil Map 5.1
Millard County
Problem Soil Risk
Major Roads
Cities
County Boundary
Problem Soil Explanation
Expansive Soils
Limestone
Silica Dunes
Gypsum Dunes
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Problem soil data developed by Utah Geologic Survey and maintained by AGRC
DIVISION OF EMERGENCY SERVICES
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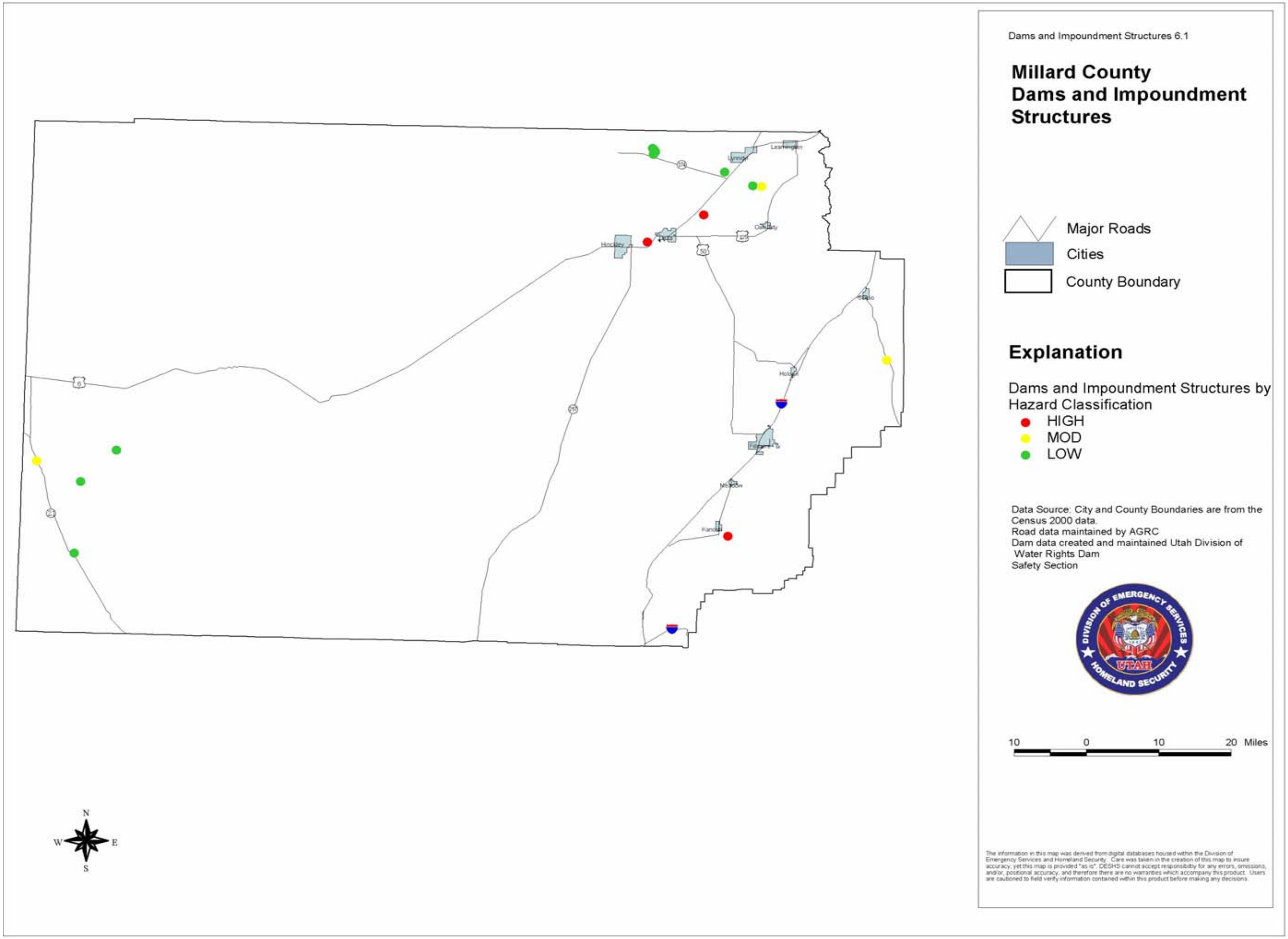
Dams and Impoundment Structures 6.1
Millard County
Dams and Impoundment
Structures
Major Roads
Cities
County Boundary
Explanation
Dams and Impoundment Structures by
Hazard Classification
HIGH
MOD
LOW
Data Source: City and County Boundaries are from the
Census 2000 data.
Road data maintained by AGRC
Dam data created and maintained Utah Division of
Water Rights Dam
Safety Section
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
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Hinckley
Delta
Lynndyl
Leamington
Oak City
Holden
Fillmore
Meadow
Kanosh
Scipio
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MITIGATION CAPABILITIES OF CERTAIN COUNTY AGENCIES

A. Millard County Emergency Management

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Coordinate emergency planning and response activities with numerous county agencies. Planning encompasses preparedness, response, recovery, and mitigation.

   b. Responsible for everyday operations of the county's Emergency Operations Center.

   c. Update and exercise emergency operations and mitigation plans.

   d. Coordinate state sponsored training for county agencies including; law enforcement, public health, social services, fire departments, emergency medical services, etc.

   e. Coordinate the county's Local Emergency Planning Committee (meets every odd-numbered month).

   f. Coordinate the county's Tier Two reporting. (Hazardous materials)

   g. Public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.

   h. Work with schools and local businesses to help create site-specific hazard response plans and present in-service education to local business employees.

   i. Responsible for timely and effective public information releases during emergency situations.

   j. During a disaster declaration, emergency management has all county resources at their disposal including manpower, communications, and equipment.

   k. Have verbal mutual aid agreements with Juab, Piute, Sanpete, Sevier, and Wayne County Emergency Management Agencies for necessary resources during a disaster situation.

l. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.

m. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. In coordination with the Six County Association of Governments, assist with applications for federal and state funding such as the Hazard Mitigation Grant Program.

   b. Involved with inspecting hazardous material storage sites and fulfilling Tier Two reporting requirements.

   c. Participate in dam inspections with the Army Corp of Engineers.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: Millard County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include:

   Millard County Commissioners, Millard County Road Department, Millard County Sheriff's Office, and various other fire, communication, and emergency medical agencies.

   b. <u>Non-local Agencies</u>: Millard County Emergency Management coordinates with numerous state and federal agencies. These agencies include the Utah Division of Emergency Services and Homeland Security, Utah Highway Patrol, State Health Department, Department of Transportation, and Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   a. Provide listings of eligible mitigation projects so counties can be prepared when funds become available.

   b. Warning systems and sirens are outdated and inadequate. At this time, funding is not available for improvements.

   c. Millard County is constantly striving to improve planning and exercise activities and response capabilities. However, with the county growing and becoming more industrial, the threat of potential hazards increases, which increases the need for resources, training, and awareness.

d. County needs to add natural hazard mitigation to the General Plan and to the zoning and subdivision ordinances. Based on funding, Six County Planning Staff will work with the county to update the General Plan and the zoning ordinances to reflect natural hazard mitigation. Existing zoning requirements for flood plain management need to be enforced.

B. Millard County Highway Department

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

    a. Design bridges, culverts, and overflow sections. The County Highway Department follows a very detailed list of design standards for all projects within the county.

    b. Continually working with the Department of Transportation on various projects since the DOT dispenses federal funding. While the DOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:

    a. Responsible for and have authority to regulate and inspect all projects completed within the county.

    b. All projects funded by the state or federal government are designed by a consulting engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the consulting engineering company and is overseen by the county to ensure standards are met. Many county projects are designed with in-house expertise and engineers are consulted if problems arise.

    c. All funding in one-way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with other government agencies:

    a. Local Agencies: The County Highway Department has little interaction with other county agencies concerning roads and bridges. They do, however, coordinate with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States Attorney's Office. The land values are usually developed by the Tax Equalization Office and approved by the County Commission.

b. Non-local Agencies: The County Highway Department coordinates with various State and Federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the Utah Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the Utah Historical Society.

4. General recommendations/Emergency Management concerns:

a. Millard County Highway Department should assist local government with floodplain management and water development permitting.

C. Central Utah Public Health

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Central Utah Public Health (CUPH) will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.

b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.

c. Programs include; waste water treatment, water pollution, public health nursing, immunization programs, solid waste regulation, food establishment inspections, air quality, and vector control.

2. Responsibility and authority in the regulating, inspecting or funding of projects.

a. CUPH Health is a unit of state government that operates through agreements or Memorandums of Understanding with the Utah Department of Health to enforce state public health statutes within the

Six County district. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with other government agencies:

    a. Local Agencies: Within the scope of public health, CUPH coordinates with the following local agencies; Millard County Emergency Management, local law enforcement agencies (city and county), local school boards, and planning and zoning agencies.

    b. Non-local Agencies: Within the scope of public health, CUPH coordinates with the following agencies; Utah Department of Health and state and federal law enforcement agencies.

4. General recommendations/Emergency Management concerns:

    a. Public Health is normally under funded and understaffed at all levels of government. Should CUPH be called upon for expertise at a time of emergency or disaster, it normally does not have instrumentation for site level determinations of any kind without support from other agencies.

    b. Public health agencies should be included in equipment storage; e.g., FEMA equipment "stored" and used at public health agencies, rather than being stored at a warehouse. For example, radio equipment that belongs to FEMA is based at county emergency management offices; the same could be done with air sampling equipment or other instruments/kits etc., which could be used by public health agencies both for daily work and at a time of emergency or disaster.

D. Millard County Sheriff's Office

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Responsible for law enforcement and criminal investigation in the county.

    b. Provide standard law enforcement manpower and equipment.

    c. In disaster situations, provide; warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

d. Provide public awareness and educational programs. (911 education, safe kids program, etc.)

e. Have mutual aid agreements with all surrounding counties and Utah State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

    a. None

3. Leadership and coordination with other government agencies:

    a. <u>Local Agencies:</u> Within the scope of law enforcement, the Millard County Sheriff's Office coordinates with various local agencies. These agencies include Millard County Emergency Management.

    b. <u>Non-local Agencies:</u> Millard County Sheriff's Office coordinates with appropriate state and federal agencies including; Utah Highway Patrol, Utah Attorney Generals Office, Bureau of Criminal Identification, Utah Department of Transportation, and Federal Bureau of Investigation.

4. General recommendations/Emergency Management concerns:

    a. None

E. <u>Millard Fire District</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Fund local city fire departments enabling them to respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.

    b. Enable local fire departments to respond to accidents in order to provide rescue assistance.

    c. Assist Emergency Medical Services in providing emergency assistance to sick and injured. (first responders)

    d. Provide standard firefighting manpower and equipment.

e. Respond to spills and releases of hazardous materials and assist in mitigating the detrimental human and environmental effects of these occurrences.

f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.

g. Provide training for department members that will enable them to effectively and efficiently carry out their respective duties and responsibilities.

h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.

i. Assist in enforcement of city fire ordinances.

j. Fire investigation.

k. Provide assistance to other jurisdictions, as department resources and commitments allow. Millard Fire District has mutual aid agreements with Juab, Piute, Sanpete, Sevier and Wayne Counties.

l. Inspections and preplanning within the fire district to reduce hazards and aid in fire prevention.

m. Assist with the county's tier two reporting. (Hazardous materials storage sites)

n. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies:</u> In efforts to decrease vulnerability to hazards, the Millard Fire District coordinates with various local agencies. These agencies include Millard County Emergency Management, Millard County Sheriff's Office, Fillmore Fire Department, Delta Fire Department, other local fire departments, local Public Works, and local Emergency Medical Services.

b. Non-local Agencies: Utah State Fire Marshal and the Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   Our district has seen an increase in number and variety of calls. As first responders, we have to train and equip our fire departments for various situations that may arise, such as: vehicle extrication, various types of hazardous materials, and many other types of responses. Each added type of response increases the need for equipment and the time our volunteers need to spend in training. With the recent decrease in population in our district, volunteer retention and recruitment is also a concern.

   a. Seek funding outside of the district for additional equipment that will improve the effectiveness of our responses as well as increase the margin of safety for our volunteers.

   b. Explore training options to cover the expanding variety of responses in our district.

   c. Look into recruitment and retention programs that will work in our district.

F. Utah State University Extension Service

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. The Utah State University Extension Service provides practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.

   b. County Extension Agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.

   c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage clientele.

   d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.

e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.

f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.

g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. Authority is at federal level.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies:</u> Millard County Emergency Management and Central Utah Public Health.

   b. <u>Non-local Agencies:</u> Utah State University, Utah State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/Emergency Management concerns:

   a. None.

OTHER AGENCY RESOURCES

A. Mitigation and risk reduction:

1. <u>Millard County Social Services:</u> Temporary assistance to needy families, food stamps, medically needy programs, adult services, homeless assistance, family planning, etc.

2. <u>Army Corps of Engineers:</u> Water and dam management within the county. Provide technical expertise, sandbags, and heavy equipment.

3. <u>Utah Highway Patrol:</u> Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

4. State Fire Marshal: Hazmat route utilization; HAZMAT technical assistance; situation and damage assessment.

5. Forestry, Fire & State Lands: Debris removal from recreational facilities; technical assistance; situation and damage assessment.

6. Utah Division of Wildlife Resources: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

7. State Radio Communications: Exercise readiness of warning systems and communication support.

8. Department of Agriculture: Assists with situation and damage assessment; coordination with USDA; HAZMAT technical assistance; state land use program.

9. Department of Workforce Services: Situation assessment and administration of disaster unemployment assistance programs.

10. Human Services: Insure liaison with private relief agencies for disaster victims.

11. State Historical Society: Project screening and situation assessment.

Annex 4 -- Piute County

In order to effectively identify and mitigate natural hazards in Piute County, a Pre-Disaster Mitigation Planning Team representing Emergency Management and each jurisdiction in the county was created. Table 1 names the members of this team. Input from the team was used in organizing hazard mitigation strategies outlined in *Annex 8* and *Appendix R* of this plan.

Table 1: Piute County Pre-Disaster Mitigation Planning Team

Name	Representing:
Ryan Horton, Emer. Mgr.	Piute County
Paul Morgan, Commissioner	Piute County
Tarval Torgersen, Commissioner	Piute County
W. Kay Blackwell, Commissioner	Piute County
Joe Dalton, Mayor	Circleville
Rick Dalton, Mayor	Junction
Carlos Jessen, Mayor	Kingston
Gerald James, Mayor	Marysvale
Terry Heath	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Past Hazard Events in Piute County

Understanding the past is often the key to discovering what the future hold, this is especially true when planning for natural disasters. The fact that cities within Piute County have experienced, for example, flooding in the past means flooding can occur in the future. While over time some of this has been mitigated for the low frequency of occurrence often results in hazards with little or no mitigation. Table 2 provides a brief history of Piute County natural disasters. This table includes only sizable events found during our research, and may not represent the total history.

Table 2: Piute County Natural Hazard History

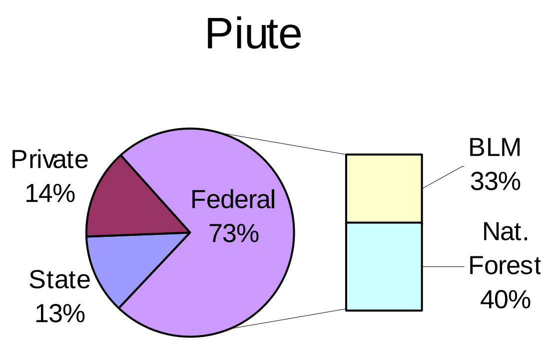
Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood	July 7, 1949	Marysvale	Extensive flood damage to highway in Marysvale Canyon.	
Flood	July 18, 1965	Marysvale	U.S. 89 damaged	
Flood	August 6, 1967	Kingston	Highway 22 damaged	Source: Kingston Canyon

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood	July 24, 1968	Marysvale	Damage to homes, crops, and U.S. 89.	
Flood Presidential	1983	Marysvale	Damaged roads, bridges, culverts, and agricultural interests.	Source: Kingston, Bullion, and Cottonwood Canyons.
Flood	August 22, 1997	Kingston Canyon	Damage to roads, waterlines, and stream channel.	Source: Monsoonal thunderstorm in Kingston Canyon.
Earthquake	October 4, 1967	Marysvale	Limited damage. U.S. 89 blocked by rock slide in Marysvale Canyon.	Richter Magnitude Scale 5.2.
Earthquake	November 4, 1974	Marysvale	Unknown	Richter Magnitude Scale 3.8
Severe Weather	August 19, 1984	Otter Creek	No Damage	Tornado
Severe Weather	June, 5 1977	Otter Creek Res.	1 death	Lightning Fishing from a small boat

Development Trends

Approximately 67,015 acres or 14% of the total land area in Piute County is privately held and outside the incorporated areas is almost entirely vacant. The other 86% is owned by the state or federal governments and aside from extractive industry is beyond the reach of development. Since land ownership determines how and where development proceeds, Figure 1 helps explain Piute County's development trends.

Figure 1: Land Ownership



The vast majority of landslides, debris flows and wildfires occur on these public lands with virtually no impact on development. Of the privately held land, most is not developable due to a lack of water and county zoning requirements of water access and a minimum of 5 acres per house. Other limitations include steepness of the terrain, flash flood plains and accessibility. There is still plenty of infill within town limits that can be utilized for safe development without developing in unincorporated, sparsely populated, or hazardous areas. For example, Marysvale (population, 370) has one of the largest geographic areas within its boundaries in the state. Piute County requires UBC on all new or proposed buildings. New subdivisions require a grading and drainage plan to mitigate any flooding, which may occur. Since most of the privately held land is along the relatively safe and accessible US 89 corridor, development is occurring in this general area.

Historically, Marysvale and Kimberly further west were mining towns cashing in on the gold found in the area in the late 19th and early 20th centuries. Kimberly is now a ghost town and Marysvale survives on Agriculture, tourism and services. Transportation development had its beginnings in the original wagon trails, which brought the pioneers to this area. US 89 follows these original trails and serves as a major historical corridor in the state running through the county north to south. This corridor is where future development is likely to happen because of the private lands along this highway. Except for lands adjacent to the Sevier River and Otter Creek and their tributaries, this corridor is relatively safe from natural hazards.

1. Earthquake

Table 3: FEMA Hazard Profile for Earthquake in Piute County

Frequency	Possible
Severity	Catastrophic
Location	Ground shaking will be felt throughout the entire county if a large earthquake were to occur. Surface fault rupture could be expected in areas of known historic fault movements. Liquefaction is expected in areas of high to moderate liquefaction potential, which covers a vast portion of Piute County.
Seasonal Pattern	None
Duration	Actual ground shaking will be under one minute yet after shocks may occur for weeks after.
Speed of Onset	No warning

Description of Location and Extent

The Six County region's earthquake threat from the Intermountain Seismic Belt and other crustal rock strain release areas is high; although there is limited risk to population due to the large areas of undeveloped lands those living in the region are at an elevated risk. During historic time the largest recorded earthquake in Piute County has not reached above 5.2 (Marysvale event) on the Richter magnitude scale, yet geologic investigation has determined much larger events have happened in the recent geologic past and could happen in the future. These events are associated with numerous faults, which exhibit signs of prior movement during the quaternary time period or the last 1.6 million years. These faults are listed in Table 4 (see Maps 1.1 and 1.2 starting on p.16 of this Annex).

Table 4: Fault Line Movement

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Sevier fault (northern portion)	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Sevier Valley - Marysvale - Circleville area faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Sevier Valley - Marysvale - Circleville area faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Tushar Mountains (east side) fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Sevier Valley fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Paunsaugunt fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Aquarius and Awapa Plateaus faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple

HAZUS MH Vulnerability Assessment

HAZUS-MH was used to determine vulnerability to earthquakes in the Six County planning area. Tables 5-9 are a summary of results from the HAZUS MH model. Damage and loss estimates are based on a 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete Piute County HAZUS MH run is available in *Appendix O.*

Number of people

Whether an earthquake occurs at night, during the day, or during a commute plays a significant role in estimating the number of casualties as outlined in Table 5.

Table 5: Casualties

Casualties	Nighttime –Minor	0
	Nighttime –Major	0
	Nighttime -Fatalities	0
	Daytime –Minor	0
	Daytime –Major	0
	Daytime- Fatalities	0
	Commute –Minor	0
	Commute –Major	0
	Commute-Fatalities	0

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 6 lists the number of buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 6: Building Damage by Count with Moderate to Complete Damage

Category	Number of Structures	Total Cost in millions of dollars **
Residential	0	0
Commercial	0	0
Industrial	0	0
Totals	0*	0**

*****Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Infrastructure Types and Amounts

Table 7 shows which critical facilities will receive damage and how much damage will result.

Table 7: Critical facilities

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	0	0	0	0
Schools	3	3	0	0
EOCs	0	0	0	0
Police Stations	1	0	0	1
Fire Stations	0	0	0	0

Debris Removal –Table 8 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour.
A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of one yard.

Table 8: Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	0
Loads (25 tons per load)	0

Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 9 provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 9: Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	0
People Displaced	0
Value Exposed (mill. $)	0

2. Floods

Table 10: FEMA Hazard Profile for Floods in Piute County

Frequency	Likely
Severity	Limited
Location	Flooding would occur in and along flood plains.
Seasonal Pattern	Piute County's main flooding threat is from snowmelt runoff during spring months.
Duration	The type of event determines the duration of flooding; flooding due to summer thunderstorms can last a couple of hours where as flooding due to spring runoff can last weeks.
Speed of Onset	Six to twelve hours.

Description of Location and Extent
Based on the flooding which occurred during the spring of 1983 and 1984 both as a result of rapid snow melt events, experience would suggest these events would appear to be a greater hazard than cloudburst storms. Yet serious hazards could result from either storm. Lands most at risk to flood are adjacent to the Sevier River and Otter Creek and their tributaries, Pine Creek, City Creek, and Rocky Ford Creek. West Canal runs along the western boundary of Circleville and could result in a flood if failure occurs.

Description of type
Precipitation in Piute County originates from two major sources. Moisture laden polar pacific air entering the area from the west or northwest during the winter produces large general storms, which most often result in heavy snowfall in the upper elevations and either snowfall or moderate intensity rainfall in the lower elevations.

The second major source of precipitation in the area arises from tropical air masses entering from the south and southwest out of the Gulf of Mexico during the summer months. Often wrongly referred to as monsoons these air masses cause high intensity convective cloudburst storms, which are augmented by the orthographic lifting which occurs as the air mass passes over neighboring mountains.

Precipitation from these two types of storms can produce flash floods, snowmelt floods, post wildfire/damaged watershed floods, and severe winter weather.

Note on Vulnerability Assessment
At this time, data was insufficient to conduct a risk analysis for flood events in Piute County. Flood Insurance Studies were study were applicable to aid in determining risk. However, the current mapping projects being led by the county and state will result in better data that will assist in understanding risk. As part of its efforts to mitigate hazards

and protect lives and property from the devastating effects of natural disasters, FEMA aims to provide individuals, businesses, and communities with information and tools to work proactively to mitigate hazards and prevent losses resulting from disasters. One of these tools is the new HAZUS MH flood model. Unfortunately, at the current time this model does not work well enough to complete loss numbers for each jurisdiction in the county.

The U.S. Army Corps of Engineers wrote a Flood Hazard Identification Study (see *Appendix N)* which is included in the flood mitigation goals found in *Annex 8* and *Appendix R* of this plan. This study looks predominately at jurisdictions which are unmapped or mapped as D zones by the National Flood Insurance Program.

Table 11 is the result of a rough estimate of structures at risk to flooding based on survey results from officials in the area.

Table 11: Structures in Flood Plain

Town Name	Households in Flood Plain/Cost
Circleville	40/3,200,000
Junction	No known risk
Kingston	50/4,000,000
Marysvale	40/3,200,000

3. Landslides

Table 12: FEMA Hazard Profile for Landslides in Piute County

Frequency	Likely
Severity	Negligible
Location	Mass wasting in Piute County is located predominately along the canyons along the Tushar Mountains (see Map 3.1 on p.18 of this Annex).
Seasonal Pattern	Landslides most often occur within Piute County during spring months with higher than normal amounts of precipitation.
Duration	Several months
Speed of Onset	No warning

Description of Location and Extent
The map "Piute County Landslide Map 3.1" shows the locations of potentially active landslides, and identifies historical landslides and their locations. Landslides are generally located in well-defined, localized areas, but when they occur is usually unpredictable. The impact of a landslide can be countywide.

A large percentage of the landmass within Piute County is historically active landslides. The same can be stated for the four incorporated towns of Marysvale, Junction, Kingston, and Circleville.

Tables 13 and 14 show the number of acres and households at risk from landslides. The extent and cost of damage to roads, railroads, and electric infrastructure are shown in Tables 15, 16, and 17, respectively.

Table 13: Landslide Acres

County Name	Acres of Active landslides	Historically Active Landslides 1847 to Present
Piute	None	180,780

Table 14: Structure Loss and Value as a Percentage of Total Acreage.

Piute County Name	**Acres of Historically Active Landslides 1847 to Present**	**Households Vulnerable to Landslide/Cost***
Circleville	443	17/1,275,000
Junction	2,561	29/2,175,000
Kingston	978	17/1,275,000
Marysvale	1251	29/2,175,000

*Includes value of land.

Table 15: Roads

Name	**Miles**	**Estimated Cost**
Local Neighborhood/local/Piute County street	165.2	398,710,200
State Route 24	3.2	7,723,200
State Route 25	1.9	4,585,650
State Route 62	.7	1,689,450
State Route 153	6.2	14,963,700
US Highway 89	1.6	3,861,600

Table data represents total length of roads, which overlay historically active landslides.

Table 16: Railroads

Railroad	**Miles**	**Estimated Cost**
Railroad	.8	1,930,800

Table 17: Electric Infrastructure

Name	Description	Estimated Cost
KV-46	2.9 Miles	138,000
KV-69	1.5 Miles	72,000
KV-230	9.5 Miles	456,000
KV-345	8 Miles	384,000

4. Wildfire Risk

Table 18: FEMA Hazard Profile for Wildfire in Piute County

Frequency	Likely
Severity	High in the Urban-Wildland Interface.
Location	Entire county except cultivated fields.
Seasonal Pattern	Most wildfires affecting Piute County occur during mid to late summer months (fire season).
Duration	The amount of time needed to contain a wildfire depends on a variety of uncontrollable variables such as: wind speed, relative humidity, type, and moisture content of fuel, weather, and topography. Thus containment time varies for each fire.
Speed of Onset	0 to 6 hours is the minimum amount of time given to homeowners in order to evacuate.

Description of Location and Extent
The Division of Emergency Services and Homeland Security augmented a statewide wildfire database to represent wildfire vulnerability into five categories: Extreme, High, Medium, Low, and Very Low. These ratings cover all of Piute County and are based on the type and density of vegetation in each area. Additional factors influencing wildland fires such as weather conditions, wind speed and direction are not considered in this risk assessment.

A moderate fire risk is located around the cities with the only high fire risk located in the northwest section of the county. This fire risk is primarily on federally managed land.

See Map 4.1 on p. 19 of this Annex for a visual display of location and severity of wildfire risk in Piute County. Tables 19-22 show the number of acres and households at different levels of wildfire risk in Piute County.

Table 19: Acres of Wildfire Risk Categories

County Name	Acres of Extreme	Acres of High	Acres of Moderate	Acres of Low/Very Low
Piute	None	2,638	191,489	295,296

Table 20: Unincorporated County

County	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Piute	None/0	4/240,000	291/17,460,000

Table 21: Acres at Risk in Incorporated Piute County*

Town Name	Acres of High	Acres of Moderate
Circleville	None	2638
Junction	None	3367
Kingston	None	1912
Marysvale	None	6626

*No Extreme wildfire risk within Piute County

Table 22: Structures in Wildfire Area

Town Name	Households in Extreme/Cost*	Households in High/Cost*	Households in Moderate/Cost*
Circleville	None/0	None/0	101/6,060,000
Junction	None/0	None/0	37/2,220,000
Kingston	None/0	None/0	33/1,980,000
Marysvale	None/0	None/0	152/9,120,000

*Excludes content value, which would result in an increase of 50% to the values listed.

Tables 23-25 show extent and cost of wildfire risk to roads, railroads, and electric infrastructure in Piute County.

Table 23: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/Piute County street	74	178,599,000
State Route 62	5	60,337,500
State Route 153	1	2,413,500
US Highway 89	4	9,654,000
US Highway Main	.9	2,172,150

Table data includes road lengths within areas determined to have an extreme, high, or moderate risk to wildfire as determined by the Utah Statewide Fire Risk Assessment.

Table 24: Railroads

Railroad	Miles	Estimated Cost
Railroad	3.5	8,400,000

Table 25: Electric Substations

Name	Description	Estimated Cost
Circleville	115 KV	10,000,000
Mineral Products	115 KV	10,000,000
Marysvale	115 KV	10,000,000
Dear Trail	PacifiCorp/115 KV	10,000,000
KV-46	25.7 Miles	1,239,000
KV-69	15.8 Miles	762,000
KV-230	16.1 Miles	777,000
KV-345	8.4 Miles	405,000

5. Problem Soils

Table 25: FEMA Hazard Profile for Problem Soils in Piute County

Frequency	Unlikely
Severity	None (0% of jurisdiction affected)
Location	None
Seasonal Pattern	None
Duration	Problems associated with soils last for long periods of time.
Speed of Onset	More than 24 hour warning time.

Description of Location and Extent
Using best available data, there is no hazard relating to problem soils in Piute County (see Map 5.1 on p.20 of this Annex).

6. Dam Failure

Table 26: FEMA Hazard Profile for Dam Failure in Piute County

Frequency	Possible
Severity	Limited
Location	Would occur downhill from existing dams.
Seasonal Pattern	None
Duration	Depends on dam and type of break; Could be a wall of water which passes through in a few hours, or a slower break which could last for weeks.
Speed of Onset	6 to 12 hours.

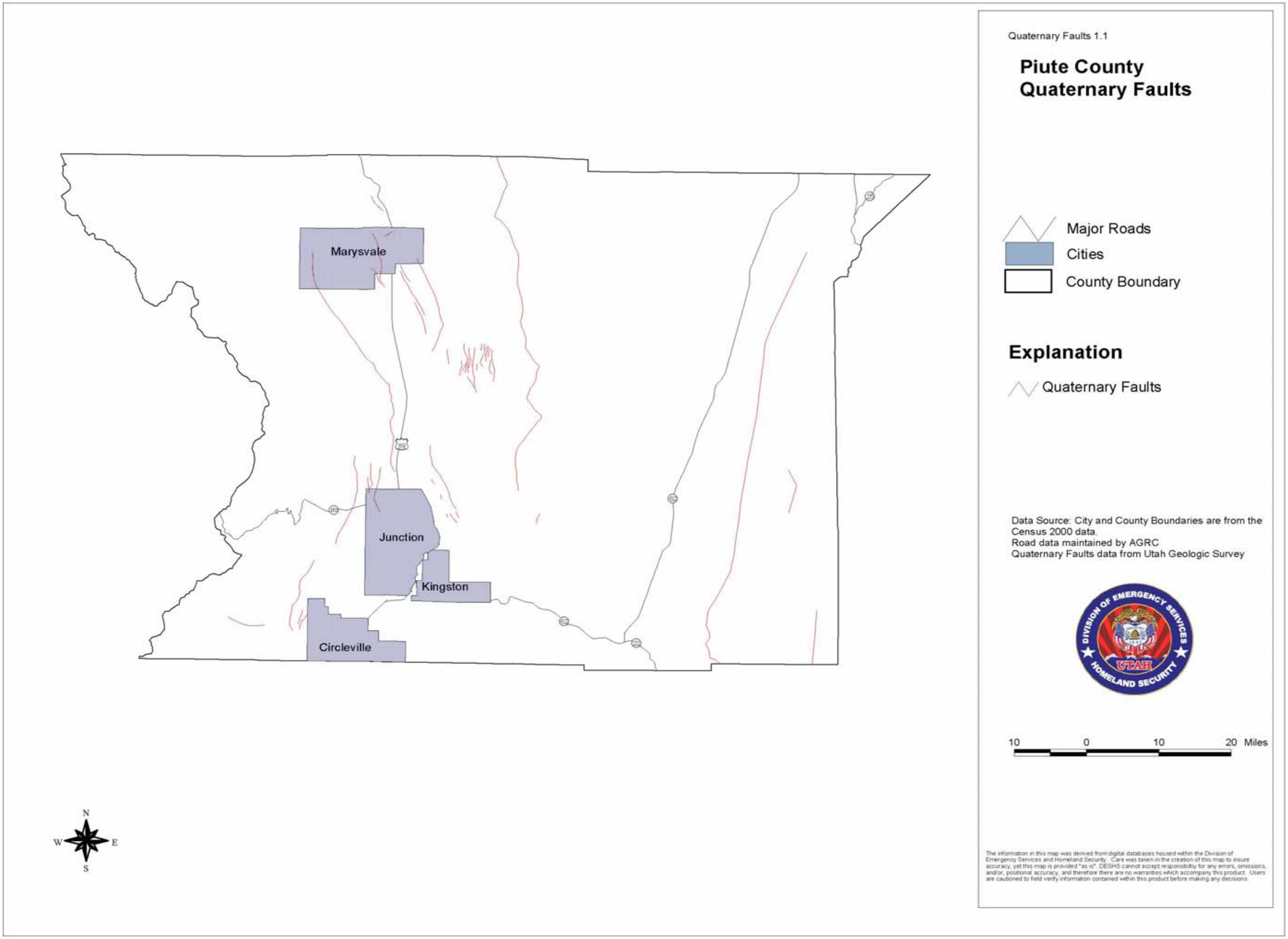
Description of Location and Extent
Of the dams located in Piute County only four dam are considered a high hazard. A high hazard is defined as a possibility of life being lost due to dam failure. All dams, regardless of rating should be monitored. It should be noted, dam safety hazard classifications are in the event of dam failure and are based upon the consequences of dam failure. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure.

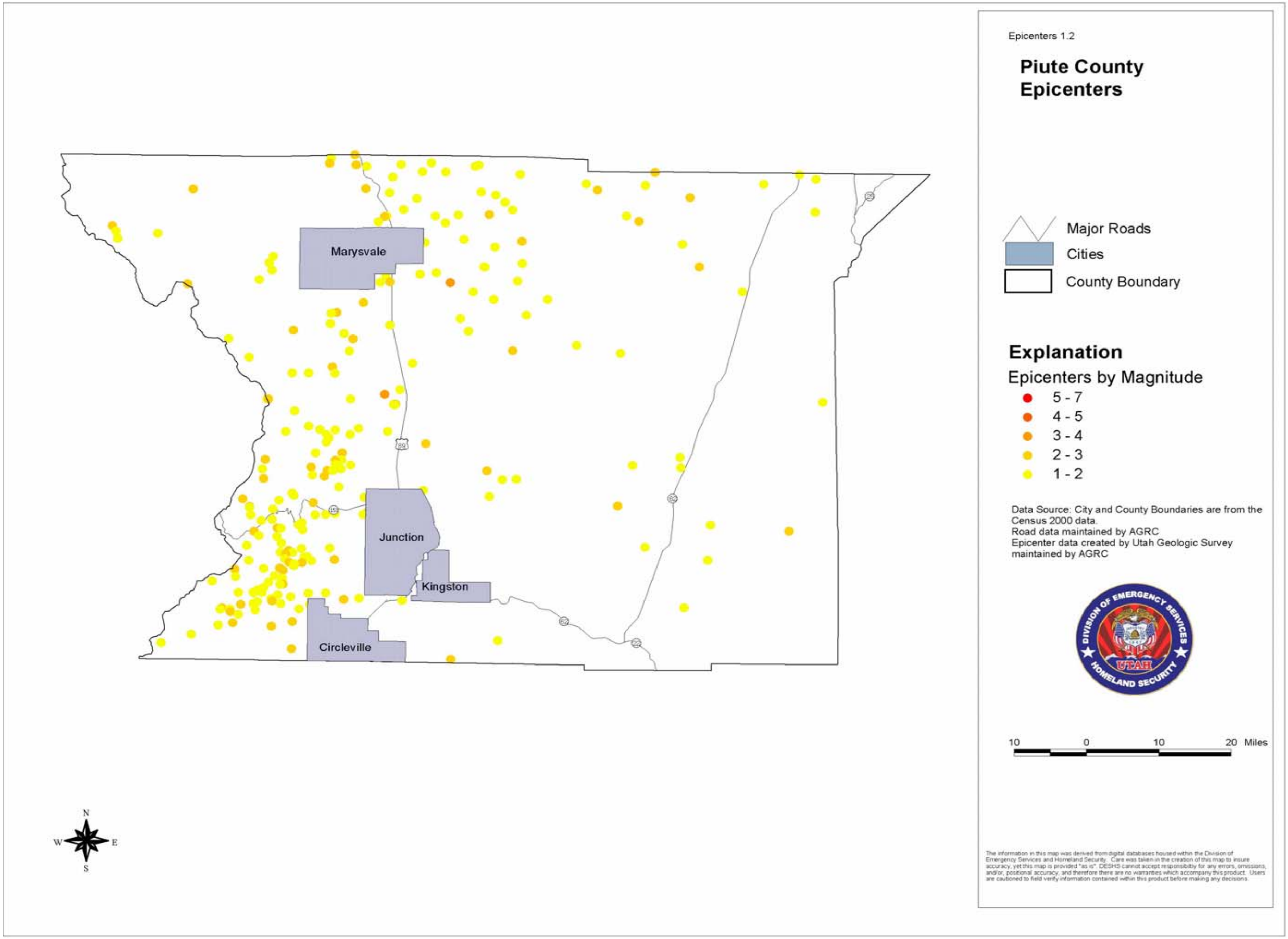
The State Division of Water Resources, Dam Safety Section indicates there are four high hazard dams within Piute County. Although Piute County is small in both area and population size standards the majority of population lives below and within about thirty miles of the Otter Creek or Piute Dams both of which are considered high hazard (see Map 6.1 on p.21 of this Annex). High hazard dams within Piute County are the following (see Table 27):

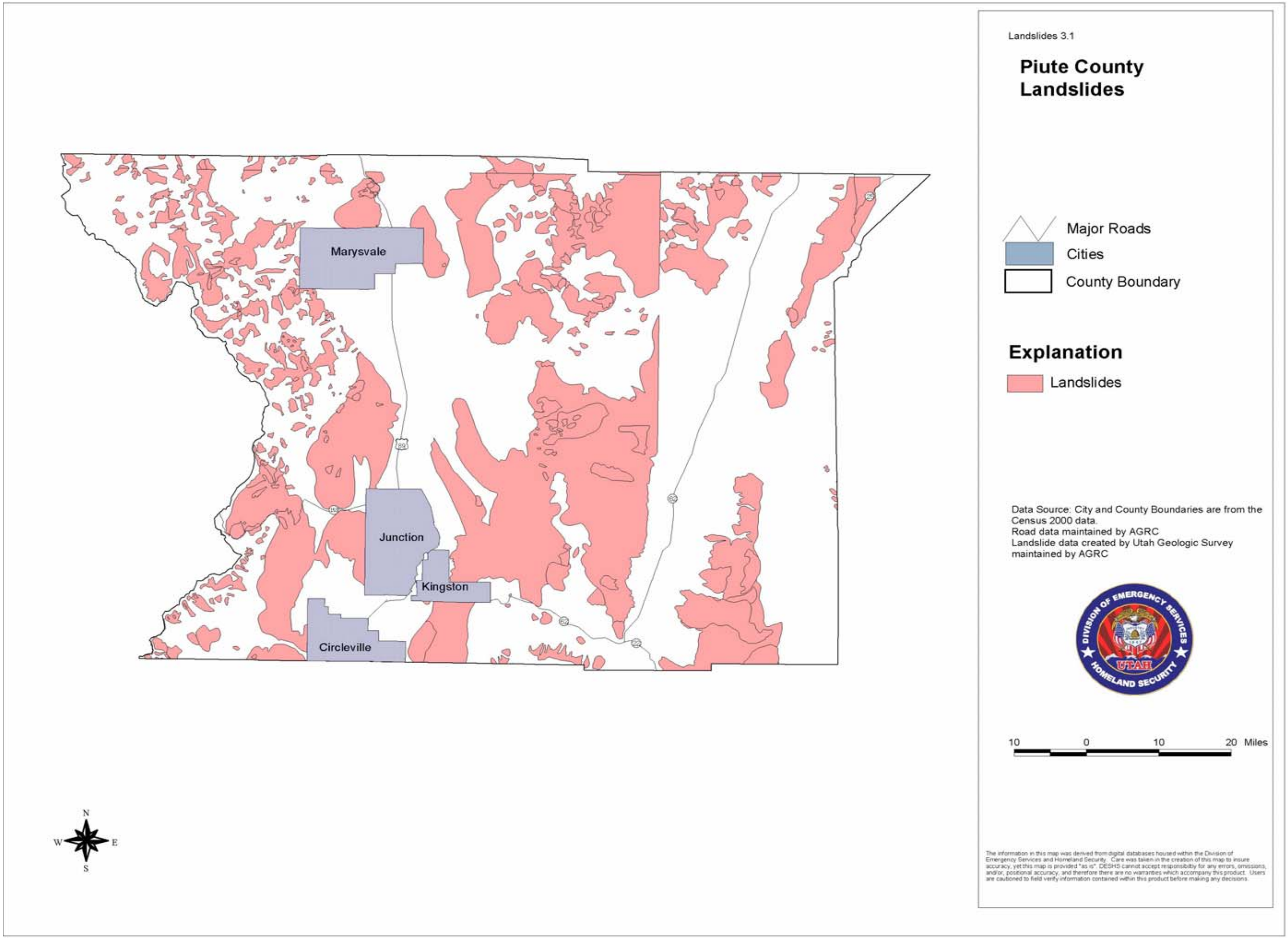
- Otter Creek
- Piute
- Upper Beaver Creek
- Lower Beaver Creek

Table 27: High Risk Dams

Name	Year Completed	Type	Storage Acre Feet	Breach Flow cfs
Otter Creek	1897	Earth Fill	52660	69000
Piute	1938	Earth Fill	71826	132000
Beaver Creek Upper	1953	Earth Fill	1401	47000
Beaver Creek Lower	1925	Earth Fill	231	15000


Quaternary Faults 1.1
Piute County
Quaternary Faults
Major Roads
Cities
County Boundary
Explanation
Quaternary Faults
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Quaternary Faults data from Utah Geologic Survey
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
Marysvale
Junction
Kingston
Circleville
N
W
E
S
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.


Epicenters 1.2
Piute County Epicenters
Marysvale
Junction
Kingston
Circleville
Major Roads
Cities
County Boundary
Explanation
Epicenters by Magnitude
5 - 7
4 - 5
3 - 4
2 - 3
1 - 2
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Epicenter data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
N
W
E
S


Landslides 3.1
Piute County Landslides
Marysvale
Junction
Kingston
Circleville
Major Roads
Cities
County Boundary
Explanation
Landslides
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Landslide data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
N
W
E
S
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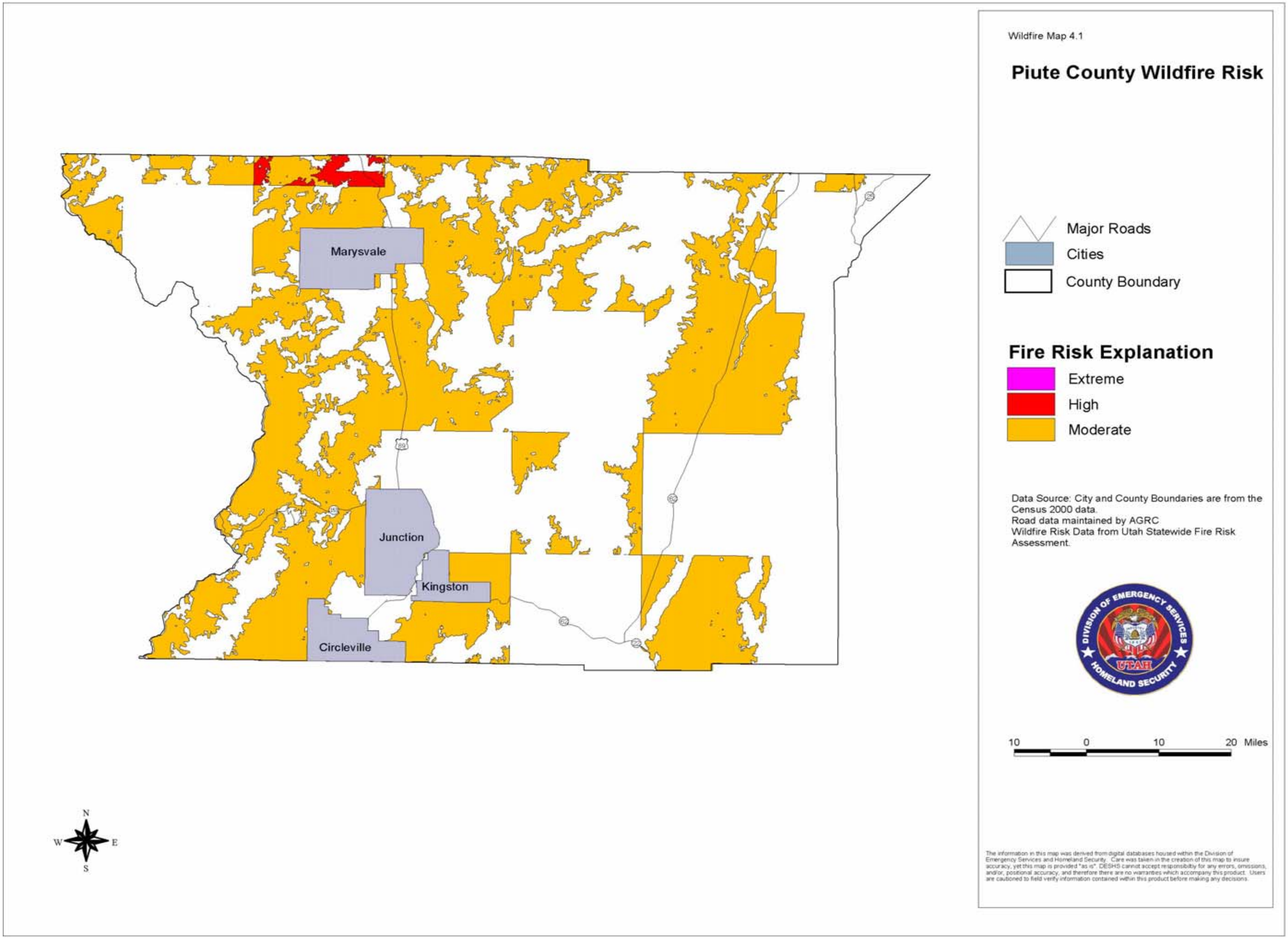
Wildfire Map 4.1
Piute County Wildfire Risk
Marysvale
Junction
Kingston
Circleville
Major Roads
Cities
County Boundary
Fire Risk Explanation
Extreme
High
Moderate
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Wildfire Risk Data from Utah Statewide Fire Risk Assessment.
DIVISION OF EMERGENCY SERVICES
HOMELAND SECURITY
UTAH
10
0
10
20 Miles
N
W
E
S
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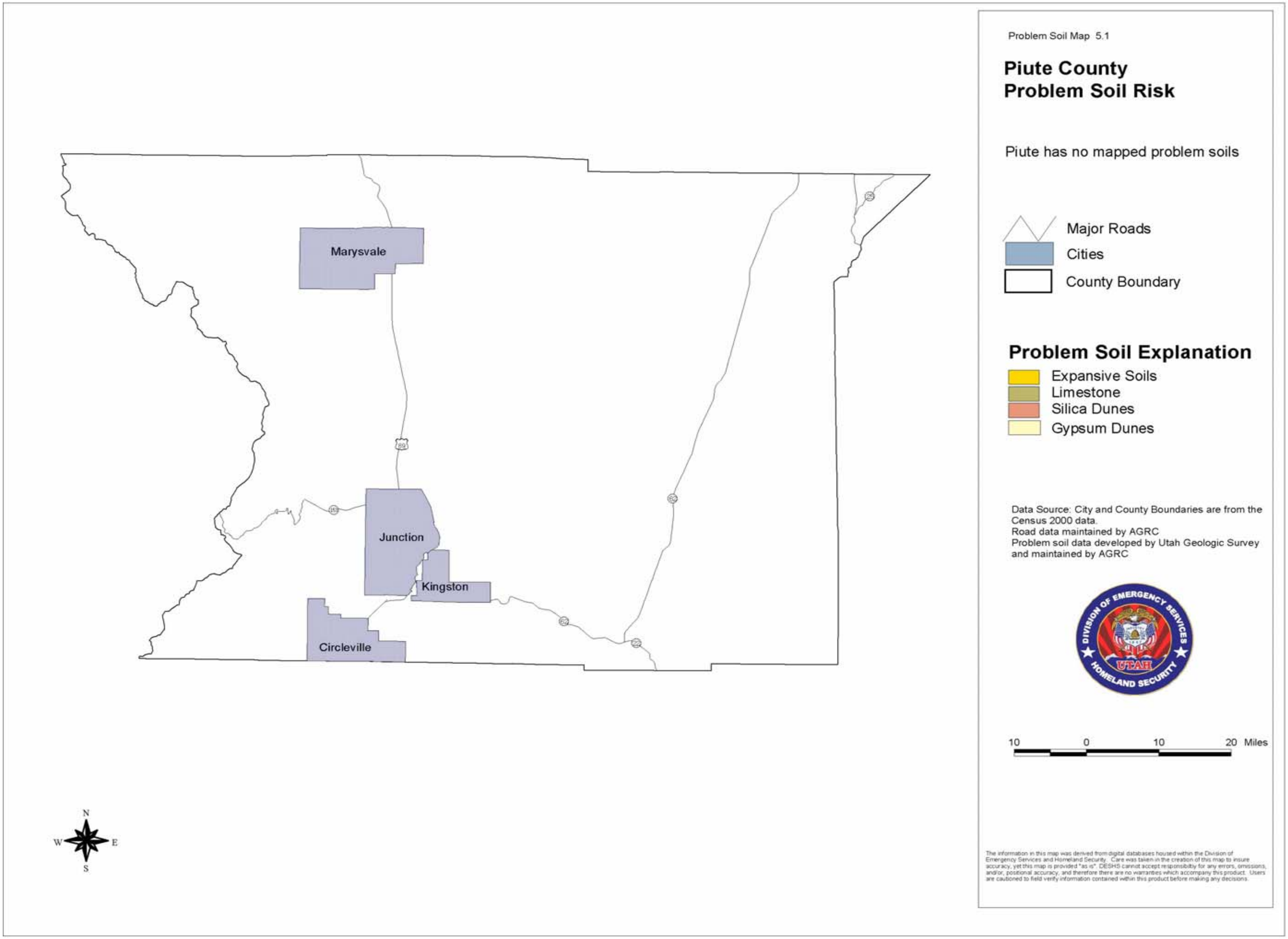
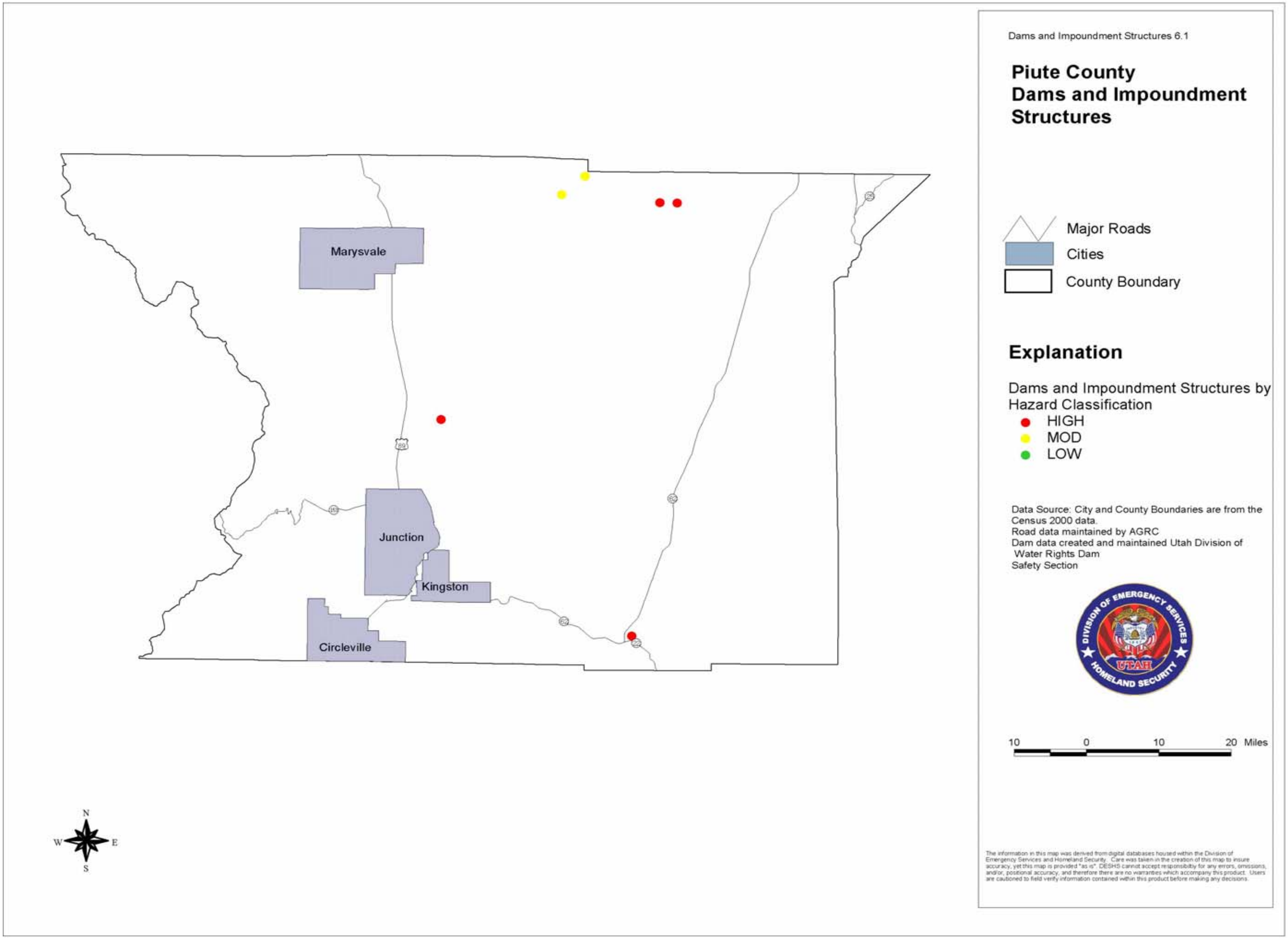


Problem Soil Map 5.1
Piute County
Problem Soil Risk
Piute has no mapped problem soils
Major Roads
Cities
County Boundary
Problem Soil Explanation
Expansive Soils
Limestone
Silica Dunes
Gypsum Dunes
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Problem soil data developed by Utah Geologic Survey and maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10
0
10
20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Marysvale
Junction
Kingston
Circleville
89
62
N
W
E
S


Dams and Impoundment Structures 6.1
Piute County
Dams and Impoundment
Structures
Major Roads
Cities
County Boundary
Explanation
Dams and Impoundment Structures by
Hazard Classification
HIGH
MOD
LOW
Data Source: City and County Boundaries are from the
Census 2000 data.
Road data maintained by AGRC
Dam data created and maintained Utah Division of
Water Rights Dam
Safety Section
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10
0
10
20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Marysvale
Junction
Kingston
Circleville
N
W
E
S

MITIGATION CAPABILITIES OF CERTAIN COUNTY AGENCIES

A. Piute County Emergency Management

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Coordinate emergency planning and response activities with numerous county agencies. Planning encompasses preparedness, response, recovery, and mitigation.

    b. Responsible for everyday operations of the county's Emergency Operations Center.

    c. Update and exercise emergency operations and mitigation plans.

    d. Coordinate state sponsored training for county agencies including; law enforcement, public health, social services, fire departments, emergency medical services, etc.

    e. Coordinate the county's Local Emergency Planning Committee. (meets quarterly)

    f. Coordinate the county's Tier Two reporting. (hazardous materials)

    g. Public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.

    h. Work with schools and local businesses to help create site-specific hazard response plans and present in-service education to local business employees.

    i. Responsible for timely and effective public information releases during emergency situations.

    j. During a disaster declaration, emergency management has all county resources at their disposal including manpower, communications, and equipment.

    k. Have verbal mutual aid agreements with Juab, Millard, Sanpete, Sevier, and Wayne County Emergency Management Agencies for necessary resources during a disaster situation.

l. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.

m. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. In coordination with the Six County Association of Governments, assist with applications for federal and state funding such as the Hazard Mitigation Grant Program.

   b. Involved with inspecting hazardous material storage sites and fulfilling Tier Two reporting requirements.

   c. Participate in dam inspections with the Army Corp of Engineers.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: Piute County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include:

   Piute County Commissioners, Piute County Road Department, Piute County Sheriff Department, and various other law enforcement, fire, communication, and emergency medical agencies.

   b. <u>Non-local Agencies</u>: Piute County Emergency Management coordinates with numerous state and federal agencies. These agencies include the Utah Division of Emergency Services and Homeland Security, Utah Highway Patrol, State Health Department, Department of Transportation, and Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   a. Provide listings of eligible mitigation projects so counties can be prepared when funds become available.

   b. Warning systems and sirens are outdated and inadequate. At this time, funding is not available for improvements.

   c. Piute County is constantly striving to improve planning and exercise activities and response capabilities.

d. County needs to add natural hazard mitigation to the General Plan and to the zoning and subdivision ordinances. Based on funding, Six County Planning Staff will work with the county to update the General Plan and the zoning ordinances to reflect natural hazard mitigation. Existing zoning requirements for flood plain management need to be enforced.

B. <u>Piute County Highway Department *</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

    a. Design bridges, culverts, and overflow sections. The County Highway Department follows a very detailed list of design standards for all projects within the county.

    b. Continually working with the Utah Department of Transportation (UDOT) on various projects since the UDOT dispenses federal funding. While the UDOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:

    a. Responsible for and have authority to regulate and inspect all projects completed within the county.

    b. All projects funded by the state or federal government are designed by a consulting engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the consulting engineering company and is overseen by the county to ensure standards are met. Many county projects are designed with in-house expertise and engineers are consulted if problems arise.

    c. All funding in one-way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with other government agencies:

    a. <u>Local Agencies</u>: The County Highway Department has little interaction with other county agencies concerning roads and bridges. They do, however, coordinate with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States Attorney's Office. The land values are usually developed by the Tax Equalization Office and approved by the County Commission.

b. Non-local Agencies: The County Highway Department coordinates with various State and Federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the Utah Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the Utah Historical Society.

4. General recommendations/Emergency Management concerns:

   a. Piute County Highway Department should assist local government with floodplain management and water development permitting.

C. Central Utah Public Health

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Central Utah Public Health (CUPH) will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.

   b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.

   c. Programs include; waste water treatment, water pollution, public health nursing, immunization programs, solid waste regulation, food establishment inspections, air quality, and vector control.

2. Responsibility and authority in the regulating, inspecting or funding of projects.

   a. CUPH Health is a unit of state government that operates through agreements or Memorandums of Understanding with the Utah Department of Health to enforce state public health statutes within the Six County district. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Within the scope of public health, CUPH coordinates with the following local agencies; Piute County Emergency Management, local law enforcement agencies (Piute County and county), local school boards, and planning and zoning agencies.

   b. Non-local Agencies: Within the scope of public health, CUPH coordinates with the following agencies; Utah Department of Health and state and federal law enforcement agencies.

4. General recommendations/Emergency Management concerns:

   a. Public Health is normally under funded and understaffed at all levels of government. Should CUPH be called upon for expertise at a time of emergency or disaster, it normally does not have instrumentation for site level determinations of any kind without support from other agencies.

   b. Public health agencies should be included in equipment storage; e.g., FEMA equipment "stored" and used at public health agencies, rather than being stored at a warehouse. For example, radio equipment that belongs to FEMA is based at county emergency management offices; the same could be done with air sampling equipment or other instruments/kits etc., which could be used by public health agencies both for daily work and at a time of emergency or disaster.

D. Piute County Sheriff's Department

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Responsible for law enforcement and criminal investigation in unincorporated areas of the county and in smaller towns that do not have police departments.

   b. Provide standard law enforcement manpower and equipment.

   c. In disaster situations, provide; warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

   d. Provide public awareness and educational programs. (911 education, safe kids program, etc.)

e. Have mutual aid agreements with all surrounding counties and the Utah State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Within the scope of law enforcement, the Piute County Sheriff's Department coordinates with various local agencies. These agencies include Piute County Emergency Management and various local police departments.

   b. Non-local Agencies: Piute County Sheriff's Department coordinates with appropriate state and federal agencies including; Utah Highway Patrol, Utah Attorney Generals Office, Bureau of Criminal Identification, Utah Department of Transportation, and Federal Bureau of Investigation.

4. General recommendations/Emergency Management concerns:

   a. None

E. Piute Fire District

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.

   b. Respond to accidents in order to provide rescue assistance.

   c. Assist Emergency Medical Services in providing emergency assistance to sick and injured. (first responders)

   d. Provide standard firefighting manpower and equipment.

   e. Respond to spills and releases of hazardous materials and assist in mitigating the detrimental human and environmental effects of these occurrences.

f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.

g. Provide training for department members that will enable them to effectively and efficiently carry out their respective duties and responsibilities.

h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.

i. Assist in enforcement of Piute County fire ordinances.

j. Fire investigation.

k. Provide assistance to other jurisdictions, as department resources and commitments allow. Piute Fire District has mutual aid agreements with Juab, Millard, Sanpete, Sevier and Wayne Counties.

l. Inspections and preplanning within the fire district to reduce hazards and aid in fire prevention.

m. Assist with the county's tier two reporting. (Hazardous materials storage sites)

n. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. Local Agencies: In efforts to decrease vulnerability to hazards, the Piute Fire District coordinates with various local agencies. These agencies include Piute County Emergency Management, Piute County Sheriff's Department, Circleville Fire Department, Marysvale Fire Department, Junction Fire Department, local Public Works, and local Emergency Medical Services.

   b. Non-local Agencies: Utah State Fire Marshal and the Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   Our district has seen an increase in number and variety of calls. As first responders, we have to train and equip our fire departments for various situations that may arise, such as: vehicle extrication, various types of hazardous materials, and many other types of responses. Each added type of response increases the need for equipment and the time our volunteers need to spend in training. With the recent decrease in population in our district, volunteer retention and recruitment is also a concern.

   a. Seek funding outside of the district for additional equipment that will improve the effectiveness of our responses as well as increase the margin of safety for our volunteers.

   b. Explore training options to cover the expanding variety of responses in our district.

   c. Look into recruitment and retention programs that will work in our district.

F. <u>Utah State University Extension Service *</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. The Utah State University Extension Service provides practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.

   b. County Extension Agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.

   c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage clientele.

   d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.

   e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.

f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.

g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. Authority is at federal level.

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Piute County Emergency Management and Central Utah Public Health.

   b. Non-local Agencies: Utah State University, Utah State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/Emergency Management concerns:

   a. None.

OTHER AGENCY RESOURCES

A. Mitigation and risk reduction:

1. Piute County Social Services: Temporary assistance to needy families, food stamps, medically needy programs, adult services, homeless assistance, family planning, etc.

2. Army Corps of Engineers: Water and dam management within the county. Provide technical expertise, sandbags, and heavy equipment.

3. Utah Highway Patrol: Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

4. State Fire Marshal: Hazmat route utilization; HAZMAT technical assistance; situation and damage assessment.

5. Forestry, Fire & State Lands: Debris removal from recreational facilities; technical assistance; situation and damage assessment.

6. Utah Division of Wildlife Resources: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

7. State Radio Communications: Exercise readiness of warning systems and communication support.

8. Department of Agriculture: Assists with situation and damage assessment; coordination with USDA; HAZMAT technical assistance; state land use program.

9. Department of Workforce Services: Situation assessment and administration of disaster unemployment assistance programs.

10. Human Services: Insure liaison with private relief agencies for disaster victims.

11. State Historical Society: Project screening and situation assessment.

Annex 5 -- Sanpete County

In order to effectively identify and mitigate natural hazards in Sanpete County, a Pre-Disaster Mitigation Planning Team representing Emergency Management and each jurisdiction in the county was created. Table 1 names the members of this team. Input from the team was used in organizing hazard mitigation strategies outlined in *Annex 8* and *Appendix S* of this plan.

Table 8: Sanpete County Pre-Disaster Mitigation Planning Team

Name	Representing:
Kevin Holman, Emer. Mgr.	Sanpete County
Bruce Blackham, Commissioner	Sanpete County
Greg Dettinger, Commissioner	Sanpete County
Claudia Jarrett, Commissioner	Sanpete County
Darwin Jensen, Mayor	Centerfield
Morris Casperson, Mayor	Ephraim
Don Worley, Mayor	Fairview
Shawn Crane, Mayor	Fayette
Scott Collard, Mayor	Fountain Green
Scott Hermansen, Mayor	Gunnison
Kim Anderson, Mayor	Manti
Doug Bjerregaard, Mayor	Mayfield
L. Scott Robertson, Mayor	Moroni
Chesley Christensen, Mayor	Mt. Pleasant
John Thomas, Mayor	Spring City
Steven Thomas, Mayor	Sterling
Byron Davis, Mayor	Wales
Fred Johnson	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Past Hazard Events in Sanpete County

Understanding the past is often the key to discovering what the future holds. This is especially true when planning for natural disasters. The fact that cities within Sanpete County have experienced, for example, flooding in the past means flooding can occur in the future. While over time some of this has been mitigated, the low frequency of occurrence often results in hazards with little or no mitigation. Table 2 provides a brief history of Sanpete County natural disasters. This table includes only sizable events found during our research, and may not represent the total history.

Table 2: Sanpete County Natural Hazard History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood	July 24, 1946	Mount Pleasant	Devastated city damaging homes, businesses, railroad tracks, water lines, livestock, and streets	$500,000 in damage. Flood originated from Mount Pleasant Canyon.
Flood	August 7, 1952	Mount Pleasant	Irrigation systems and farmlands	$10,000 dollars in damage. Flooding from Birch Creek and North Creek
Flood	July 30, 1956	Manti	Farms, irrigation canals, and roads.	Willow Creek
Flood	August 5, 1961	Fountain Green	Farmlands, crops, and fish hatchery.	$31,000 in damage. Flood from Tidds and Log Canyons
Flood	July 17-19, 1965	Ephraim	Damage to roads, canals, and a flood control dam.	Willow Creek
Flood	July 31, 1965	Mount Pleasant/Wales/ Spring City	Roads and culinary water system	$10,000 in damage. Pleasant Creek and Twin Creek.

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Presidential	1983	Centerfield, Ephraim, Fairview, Fountain Green, Gunnison, Manti, Mayfield, Moroni, Mount Pleasant, Sterling, and Spring City.	All sectors impacted by event loss to road, culverts, agriculture, sewer, infrastructure, flood controls, etc.	Source Twelve-mile, Cottonwood, Creeks, Pole Gamit, and Log Canyons, Peacock springs, San Pitch River. Public road damage amounted to $650,000.
Flood Presidential	1984	County wide	All sectors impacted by event loss to road, culverts, agriculture, sewer, infrastructure, flood controls, etc.	Public assistance totals $1,382,136.
Flood	July 22, 1998	Spring City	Damage to road, bridges, water supply, diversion structures, and 12 homes.	$2.5 million est. damage from Canal and Oak Creeks.
Flood	2002-2003	Clarion, Lone Cedar Road	Damage to structures and road.	Two years in a row.
Earthquake	March 22, 1876	Moroni	Unknown	Richter Magnitude Scale 5.0 with Aftershocks.
Earthquake	November 23, 1904	Manti	Unknown	Richter Magnitude Scale 3.7 with Aftershocks.
Earthquake	November 25, 1904	Manti	Unknown	Richter Magnitude Scale 3.7

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Earthquake	June 4, 1942	Moroni	Unknown	Richter Magnitude Scale 4.3
Earthquake	November 4, 1948	Manti	Unknown	Richter Magnitude Scale 4.3
Earthquake	April 16, 1961	Ephraim	Limited damage	Richter Magnitude Scale 5.0 with Aftershocks.
Earthquake	January 16, 1968	Fayette	Unknown	Richter Magnitude Scale 3.5 with Aftershocks.
Severe Weather	August 25, 1963	Manti/Ephraim	Crop damage	Heavy rain, hail, and wind damage.
Severe Weather	June 16, 1955	Fayette	Roof, tree, and crop damage	Tornado $5,000 in damage
Severe Weather	June 16, 1955	Fayette	No Damage	Tornado
Severe Weather	August 28, 1964	Gunnison	Broken windows, chicken coop destroyed, and two automobiles damaged	Tornado $2,000 in damage
Severe Weather	August 15, 1984	Manti	Broken fence	Tornado
Severe Weather	May 24, 2000	Gunnison	Minor damage	Tornado F0
Severe Weather	August 8, 2001	Fairview	No Damage	Tornado
Severe Weather	September 8, 2002	Centerfield	No Damage	Tornado F0
Severe Weather	September 8, 2002	Manti	Large amount of damage to homes, trees, and automobiles.	Tornado F2 (see Picture 1 below table) estimated damage $2,000,000.
Severe Weather	August 25, 1956	Manti	1 death	Lightning Bailing straw

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Severe Weather	August, 1957	Mount Pleasant	1 death	Lightning Herding sheep
Severe Weather	June 1, 1963	Indianola	1 death	Herding sheep

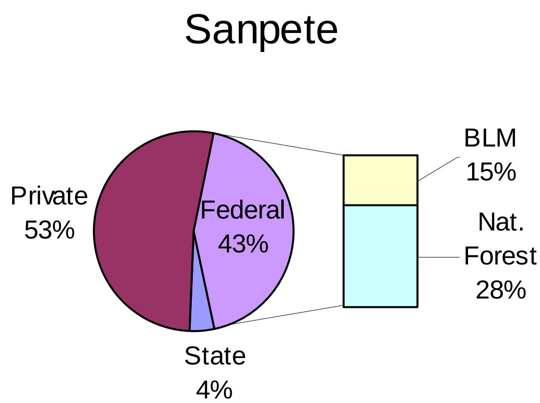
(Source: History of Sanpete County, Utah State Historical Society.)

Picture 1, September 8, 2002--Manti, Utah

Development Trends

Approximately 727,057 acres or 53% of the total land area in Sanpete County is privately held and outside the incorporated areas is almost entirely vacant. The other 47% is owned by the state or federal governments and aside from extractive industry is beyond the reach of development. Since land ownership determines how and where development proceeds, Figure 1 helps explain Sanpete County's development trends.

Figure 1: Land Ownership



The vast majority of landslides, debris flows and wildfires occur on these public lands with virtually no impact on development. Of the privately held land, most is not developable due to a lack of water and county zoning requirements of water access and a minimum of 5 acres per house. Other limitations include steepness of the terrain, flash flood plains and accessibility. There is still plenty of infill within city limits that can be utilized for safe development without developing in unincorporated, sparsely populated, or hazardous areas. Sanpete County requires UBC on all new or proposed buildings. New subdivisions require a grading and drainage plan to mitigate any flooding, which may occur. Since most of the privately held land is along the relatively safe US 89 corridor, development is occurring in this general area. The railroad spur from Juab County will go through Sanpete County as it is routed into Sevier County. This will be a major development adjacent to Gunnison and Fayette when it is completed.

Historically and today, agriculture plays a huge part in the economy of Sanpete County. Transportation development had its beginnings in the original wagon trails, which brought the pioneers to this area. Later roads and US 89 followed this north-south route, which is an important historical corridor in the state and nation. This corridor is where future development is likely to happen because of the private lands along this major highway. Except for lands adjacent to the San Pitch and Sevier Rivers and their tributaries, this corridor is relatively safe from natural hazards.

1. Earthquake

Table 3: FEMA Hazard Profile for Earthquake in Sanpete County

Frequency	Possible
Severity	Catastrophic
Location	Ground shaking will be felt throughout the entire county if a large earthquake were to occur. Surface fault rupture could be expected in areas of known historic fault movements. Liquefaction is expected in areas of high to moderate liquefaction potential, which covers a vast portion of Sanpete County.
Seasonal Pattern	None
Duration	Actual ground shaking will be under one minute yet after shocks may occur for weeks after.
Speed of Onset	No warning

Description of Location and Extent

The Six County region's earthquake threat from the Intermountain Seismic Belt and other crustal rock strain release areas is high; although there is limited risk to population due to the large areas of undeveloped lands those living in the region are at an elevated risk. During historic time the largest recorded earthquake in Sanpete County has not reached above 5.0 on the Richter magnitude scale, yet geologic investigation has determined much larger events have happened in the recent geologic past and could happen in the future. These events are associated with numerous faults, which exhibit signs of prior movement during the quaternary time period or the last 1.6 million years: These faults are listed in Table 4 (see Maps 1.1 and 1.2 starting on p.23 of this Annex).

Table 4: Fault Line Movement

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Wasatch fault zone - Levan section	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Sectioned
Wasatch fault zone - Fayette section	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Sectioned
Wasatch fault zone - Fayette section	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Sectioned
Gooseberry graben	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Gunnison fault	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Gunnison fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Japanese and Cal Valleys faults	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Japanese and Cal Valleys faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Valley Mountains monocline	Quaternary (<1,600,000 years)	NA	Suspected

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Wasatch monocline	Quaternary (<1,600,000 years)	NA	Suspected
White Mountain area faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Snow Lake graben	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Joes Valley fault zone west fault	Latest Quaternary (<15,000 years)	0.2 - 1 mm/yr	Simple
Joes Valley fault zone west fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Joes Valley fault zone intragraben faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple

HAZUS MH Vulnerability Assessment

HAZUS-MH was used to determine vulnerability to earthquakes in the Six County planning area. Tables 5-9 are a summary of results from the HAZUS MH model. Damage and loss estimates are based on a 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete Sanpete County HAZUS MH run is available in *Appendix O.*

Number of people

Whether an earthquake occurs at night, during the day, or during a commute plays a significant role in estimating the number of casualties as outlined in Table 5.

Table 5: Casualties

Casualties	Nighttime –Minor	143
	Nighttime –Major	3
	Nighttime -Fatalities	7
	Daytime –Minor	140
	Daytime –Major	5
	Daytime- Fatalities	9
	Commute –Minor	128
	Commute –Major	4
	Commute-Fatalities	8

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 6 lists the number of buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 6: Building Damage by Count with Moderate to Complete Damage

Category	Number of Structures	Total Cost in millions of dollars **
Residential	558	125.59
Commercial	18	19.44
Industrial	5	8.76
Totals	2,911*	167.39**

***Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Infrastructure Types and Amounts
Table 7 shows which critical facilities will receive damage and how much damage will result.

Table 7: Critical facilities

Classification	**Total**	**Least Moderate Damage >50%**	**Complete Damage > 50%**	**Functionality > 50% at day 1**
Hospitals	2	2	0	0
Schools	13	0	0	0
EOCs	0	0	0	0
Police Stations	5	0	0	0
Fire Stations	1	0	0	1

Debris Removal –Table 8 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 8: Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	110
Loads (25 tons per load)	4,400

Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 9 provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 9: Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	1
People Displaced	0
Value Exposed (mill. $)	0

2. Floods

Table 10: FEMA Hazard Profile for Floods in Sanpete County

Frequency	Likely
Severity	Limited
Location	Flooding would occur in and along flood plains.
Seasonal Pattern	Sanpete County's main flooding threat is from flash floods from heavy monsoonal rains.
Duration	The type of event determines the duration of flooding; flooding due to summer thunderstorms can last a couple of hours where as flooding due to spring runoff can last weeks.
Speed of Onset	Six to twelve hours.

Description of Location and Extent
The population of Sanpete County is primarily located within the Sanpete Valley, which is boarded on the east by the Wasatch Plateau and to the west by the San Pitch Mountains. Thus the Sanpete Valley is topographically low heightening residents risk to spring snowmelt flooding, coming from high mountain snow pack. Typical western settlement patterns exist through Sanpete County mean people originally settled along area water sources at the mouths of mountain canyons. Thus streams running through population centers and alluvial fan development are quite common.

Incorporated areas within Sanpete County and the streams, which cause flooding problems, are listed below.

Manti:
Manti Creek (floods on occasion)
Ephraim:
Ephraim Creek (floods on occasion)
Mt. Pleasant:
Pine Creek/Twin Creeks (floods often)
Pleasant Creek (floods on occasion)
Fairview:
Cottonwood Creek (moderate, unless blocked by landslide)
San Pitch River (minor)
Fountain Green:
Log Canyon Creek
Uinta Creek
Gemmett Creek
Gunnison:
San Pitch (Moderate to Major)

Spring City:
Oak Creek
Canal Creek (floods often)
Sterling:
Six Mile Creek (minor)
Wales:
Wales Canyon Creek (minor)
Mayfield:
1997. Twelve Mile Creek (moderate through The Order, is part of Mayfield) otherwise minor. Landslides or logjams could aggravate the flood threat.
Centerfield:
1997. No main stream. Sevier and San Pitch River are closest, not threatening.
No serious flood threat, local runoff could be a problem.
Moroni:
1997. San Pitch River (just the corner of town; moderate).
Fayette:
There is a wash (Warm Creek, where a spring is located; minor) (Fayette Creek runs through the middle of town and is generally dry; small watershed; minor) that comes through Fayette that has some flood potential. It may not be named. The Sevier River is nearby but generally poses no flood threat to Fayette.

History
The floods of 1983 and 1984 were especially devastating for Sanpete County residents. Total economic loss to cities and the county exceeded $1 million in 1983 and nearly $500,000 in 1984. Floodwaters from these events destroyed many bridges, culverts, water lines, and sewer lines with in Sanpete County.
Spring City
Historic Spring City has faced floods since its earliest times, but the “old timers” describe floods of their memories back to 1934, when a severe snowmelt flood inundated Spring City for about two weeks. Another snowmelt flood struck the city in 1952 and again in 1983. A flash flood on Canal Creek just two years ago destroyed a county bridge. Numerous landslides formed above both Canal Creek and Oak Creek in 1983 and continue to threaten Spring City.

THE FLASH FLOODS OF JULY 22 - 27, 1998:
Monsoonal storms concentrated on Sanpete County, Utah, from July 22 through July 27, 1998, producing flash flooding that resulted in an estimated $2.5 million in damages at historic Spring City (pop. 900; additional affected county pop. 200). Evacuations were implemented for both main events. The flood of July 22 began on Canal Creek at about 5:00 p.m. and began to subside at about 10:00 p.m. The flood of July 27 occurred on both Canal and Oak Creeks about 7:00 p.m. and lasted into the morning hours. Long-time residents indicate that this was the greatest flooding experienced to-date by the community. Two main flood events occurred five days apart, with numerous lesser but frightening intervening events. For example, on July 24, a storm settled again into the Canal Creek watershed. It began raining on Horseshoe Mountain about 6:00 p.m. The city was filling sandbags at 7:00 p.m. and residents of the south end of town were

evacuated. About 7:30 p.m., residents of the alluvial fan had to “scatter the water” to different ditches because the water had already risen. Fortunately, the storm passed rapidly across and damaging flooding was alleviated.

No storm frequencies could be determined for these events because the area lies on the fringes of both the Salt Lake City and Cedar City Doppler Radar systems. At nearby Manti, one storm on July 24 dropped 0.81 inches of rain in 45 minutes equaling a 100-year storm event (State Climatologist data). Still, in contrast, on July 22, only 0.26 inches of rain was measured in Spring City, when the main Canal Creek Flood occurred; no figures are available for rainfall in the that watershed. High water marks and stream gradients allowed for estimates of flash flood surges (possibly not sustained flows), which reached discharges of about 2,500 cfs on Canal Creek, which flows across the south side of Spring City, and of 2,400 - 4,000 cfs on Oak Creek, which passes across the north side of Spring City. The causes of such amazing flows, likely surges, seems to have been major log jams within each canyon which left “debarked” logs perched 15 feet above stream banks high in Canal Creek Canyon (Temple Fork). Canal Creek has never had a stream gage, and, therefore, very little is known about historic discharges there. A U.S. Geological Survey stream gage at the mouth of Spring City Canyon (Oak Creek), abandoned in 1992 due to State funding cutbacks, suggests that a 100-year flood should produce some 400 cfs, which could have been equivalent to the sustained flows.

The floods of July 22nd and 27th on Canal Creek and then on the 27th on Oak Creek were described in similar terms by local residents as coming in viscous muddy surges that filled the channel immediately to a depth of four feet, then spread laterally across fields toward the city. The muddy mix had the consistency of soupy concrete or cake mix. Moving across the fields, the thick mud tumbled a debris-front of logs and boulders, stacking frequently to a depth of four or five feet, then shifting to other directions of flow. Mud depths of 10-12 feet were reported during the forward movement of the flood. Through this process, the debris flood spread across a width of about 1,000 feet, causing the emergency evacuation of the south end of town on the 22nd (Canal Creek), and then evacuations of both the south and north ends of town on the 27th (both Canal Creek and Oak Creek). On the 27th, twelve homes were reported damaged, the cities water supply system was damaged, losing two of three sources, causing restricted culinary water use throughout the community. Two county bridges were destroyed by major log jams and impacts from massive amounts of large boulders and two main diversion structures also used historically for flood control purposes, a hydro-diversion, and other diversions were destroyed or damaged. The city lost its only flood control systems on Canal Creek in both floods, causing a rush to restore flood control before the next storm. The city is repeating, for the second time in two weeks, spending an average of $25,000 per day for emergency cleanup and repairs; more monsoonal storms are forecast for the coming week.

At the present time, channel capacities are greatly diminished in both Canal and Oak Creeks. The historic city of Spring City is presently at much risk and the next monsoonal storm over the area could cause substantial additional damage to the city. While cities across the nation make great efforts to protect historic structures, efforts must be made here to protect an entire historic community. This requires special considerations at all levels of government, not only for disaster recover, but also for flood hazard mitigation.

Note on Vulnerability Assessment

At this time, except for the Spring City area, data was insufficient to conduct a full risk analysis for flood events in Sanpete County. However, the current mapping projects being led by the county and by the state will result in better data that will assist in understanding risk. As part of its efforts to mitigate hazards and protect lives and property from the devastating effects of natural disasters, FEMA aims to provide individuals, businesses, and communities with information and tools to work proactively to mitigate hazards and prevent losses resulting from disasters.

The U.S. Army Corps of Engineers wrote a Flood Hazard Identification Study (see *Appendix N)* which is included in the flood mitigation goals found in *Annex 8* and *Appendix S* of this plan. This study looks predominately at jurisdictions which are unmapped or mapped as D zones by the National Flood Insurance Program.

3. Landslides

Table 11: FEMA Hazard Profile for Landslides in Sanpete County

Frequency	Likely
Severity	Moderate
Location	Mass wasting in Sanpete County is located predominately along the Canyon's east of the Sanpete Valley and in the mountains and foothills between Fairview and Fountain Green (see map 3.1 on p.25 of this Annex; No data available south of Spring City in Sanpete County).
Seasonal Pattern	Landslides most often occur within Sanpete County during spring months with higher than normal amounts of precipitation.
Duration	Several months
Speed of Onset	No warning

Description of Location and Extent
The map "Sanpete County Landslide Map 3.1" shows the locations of potentially active landslides, and identifies historical landslides and their locations. Landslides are generally located in well-defined, localized areas, but when they occur is usually unpredictable. The impact of a landslide can be countywide.

Very little land in Sanpete County is affected by landslides according to the GIS data layer a composite of landslide maps put together by Kimm M. Harty of the Utah Geologic and Mineral Survey in 1991. Yet this map exhibits features suggesting the southern half of Sanpete County has not been mapped. Thus, the results that follow most likely are low estimates.

Tables 12 and 13 show the number of acres and households at risk from landslides. The extent and cost of damage to roads and electric infrastructure are shown in Tables 14 and 15, respectively.

Table 12: Acres of Landslides

County Name	Acres of Active landslides	Historically Active Landslides 1847 to Present
Sanpete	997	65,398

Table 13: Structure Loss and Value as a Percentage of Total Acreage

City Name	Acres of Historically Active Landslides 1847 to Present	Households Vulnerable to Landslide/Cost*
Fountain Green	1	1/95,000

*Includes value of land.

Table 14: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	153.3	369,989,550
State Route 31	4.8	11,584,800
State Route 132	.2	482,700

Table 14 data represents total lengths of roads, which overlay historically active landslides.

Railroads
This vulnerability analysis using best available data found no railroad track at risk in Sanpete County.

Table 15: Electric Infrastructure

Name	Description	Estimated Cost
KV-46 Line	3.8 Miles	183,000
KV-138 Line	.3 Miles	14,400
KV-345 Line	1.5 Miles	72,000

4. Wildfire Risk

Table 16: FEMA Hazard Profile for Wildfire in Sanpete County

Frequency	Likely
Severity	High in the Urban-Wildland Interface.
Location	Entire county except cultivated grounds.
Seasonal Pattern	Most wildfires affecting Sanpete County occur during mid to late summer months (fire season).
Duration	The amount of time needed to contain a wildfire depends on a variety of uncontrollable variables such as: wind speed, relative humidity, type, and moisture content of fuel, weather, and topography. Thus containment time varies for each fire.
Speed of Onset	0 to 6 hours is the minimum amount of time given to homeowners in order to evacuate.

Description of Location and Extent

The Division of Emergency Services and Homeland Security augmented a statewide wildfire database to represent wildfire vulnerability into five categories: Extreme, High, Medium, Low, and Very Low. These ratings cover all of Sanpete County and are based on the type and density of vegetation in each area. Additional factors influencing wildland fires such as weather conditions, wind speed and direction are not considered in this risk assessment.

Wildfire Risk per the GIS data details an area of high wildfire risk along the north east boundary of Manti City. The North Sanpete Fire Council gave additional input on wildfire risk in Sanpete County. This council came together because of a high wildfire risk in the subdivisions of Hideaway Valley, Blackhawk Estates, Indian Ridge, Panorama Woods, Fairview Ranchos, and Indianola. The Council produced the North Sanpete County Regional Fire Plan for the wildland/urban interface. This document containing a detailed look at risk as well as mitigation can be found in *Appendix F*.

See Map 4.1 on p. 26 of this Annex for a visual display of location and severity of wildfire risk in Sanpete County. Tables 17-20 show the number of acres and households at different levels of wildfire risk in Sanpete County.

Table 17: Acres at Risk in Unincorporated County

County Name	Acres of Extreme	Acres of High	Acres of Moderate	Acres of Low/Very Low
Sanpete	None	25,521	221,920	777,393

Table 18: Households at Risk in Unincorporated County

County	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Sanpete	None/0	197/14,972,000	1,710/129,960,000

Table 19: Acres at Risk in Incorporated Sanpete County*

City Name	Acres of High	Acres of Moderate
Centerfield	None	None
Ephraim	None	298
Fairview	None	None
Fayette	None	None
Fountain Green	None	1
Gunnison	None	203
Manti	128	None
Mayfield	None	22
Moroni	None	2
Mt. Pleasant	None	3
Spring City	None	None
Sterling	None	None
Wales	None	48

*No Extreme wildfire risk within Sanpete County

Table 20: Structures in Wildfire Area

City Name	Households in Extreme/Cost*	Households in High/Cost*	Households in Moderate/Cost*
Centerfield	None/0	None/0	No known risk
Ephraim	None/0	None/0	166/12,616,000
Fairview	None/0	None/0	None/0
Fayette	None/0	None/0	None/0
Fountain Green	None/0	None/0	None/0
Gunnison	None/0	None/0	32/2,432,000
Manti	None/0	104/7,904,000	None/0
Mayfield	None/0	None/0	6/456,000
Moroni	None/0	None/0	1/76,000
Mt. Pleasant	None/0	None/0	2/152,000
Spring City	None/0	None/0	None/0
Sterling	None/0	None/0	None/0
Wales	None/0	None/0	21/1,596,000

*Excludes content value, which would result in an increase of 50% to the values listed.

Tables 21-23 show extent and cost of wildfire risk to roads, railroads, and electric infrastructure in Sanpete County.

Table 21: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	1,310	3,161,685,000
State Route 28	4.8	11,584,800
State Route 29	15	36,202,500
State Route 31	1.6	3,861,600
State Route 132	1.5	3,620,250
State Route 137	.1	241,350
State Route 264	.3	724,050
US Highway 89	17.3	41,753,550

Table 21 data includes road lengths within areas determined to have an extreme, high, or moderate risk to wildfire as determined by the Utah Statewide Fire Risk Assessment.

Table 22: Railroads

Railroad	Miles	Estimated Cost
Railroad	.2	480,000

Table 23: Electric

Name	Description	Estimated Cost
Moroni Substation	115 KV	10,000,000
Interconnection Point	Near Mt. Pleasant	TBD
Interconnection Point	Near Ephraim	TBD
KV-46 Line	22.1 miles	1,068,000
KV-138 Line	1.2 miles	57,000
KV-345	28.6 miles	1,380,000

5. Problem Soils

Table 24: FEMA Hazard Profile for Problem Soils in Sanpete County

Frequency	Likely
Severity	Negligible (10-25% of jurisdiction affected)
Location	Typically occur at the valley's boundary with foothills.
Seasonal Pattern	None
Duration	Problems associated with soils last for long periods of time.
Speed of Onset	More than 24 hour warning time.

Description of Location and Extent
The greatest hazard from problem soils is Limestone near Fairview, Ephraim, and Manti (see Map 5.1 on p.27 of this Annex).

6. Dam Failure

Table 25: FEMA Hazard Profile for Dam Failure in Sanpete County

Frequency	Possible
Severity	Limited
Location	Would occur downhill from existing dams.
Seasonal Pattern	None
Duration	Depends on dam and type of break; Could be a wall of water which passes through in a few hours, or a slower break which could last for weeks.
Speed of Onset	6 to 12 hours.

Description of Location and Extent

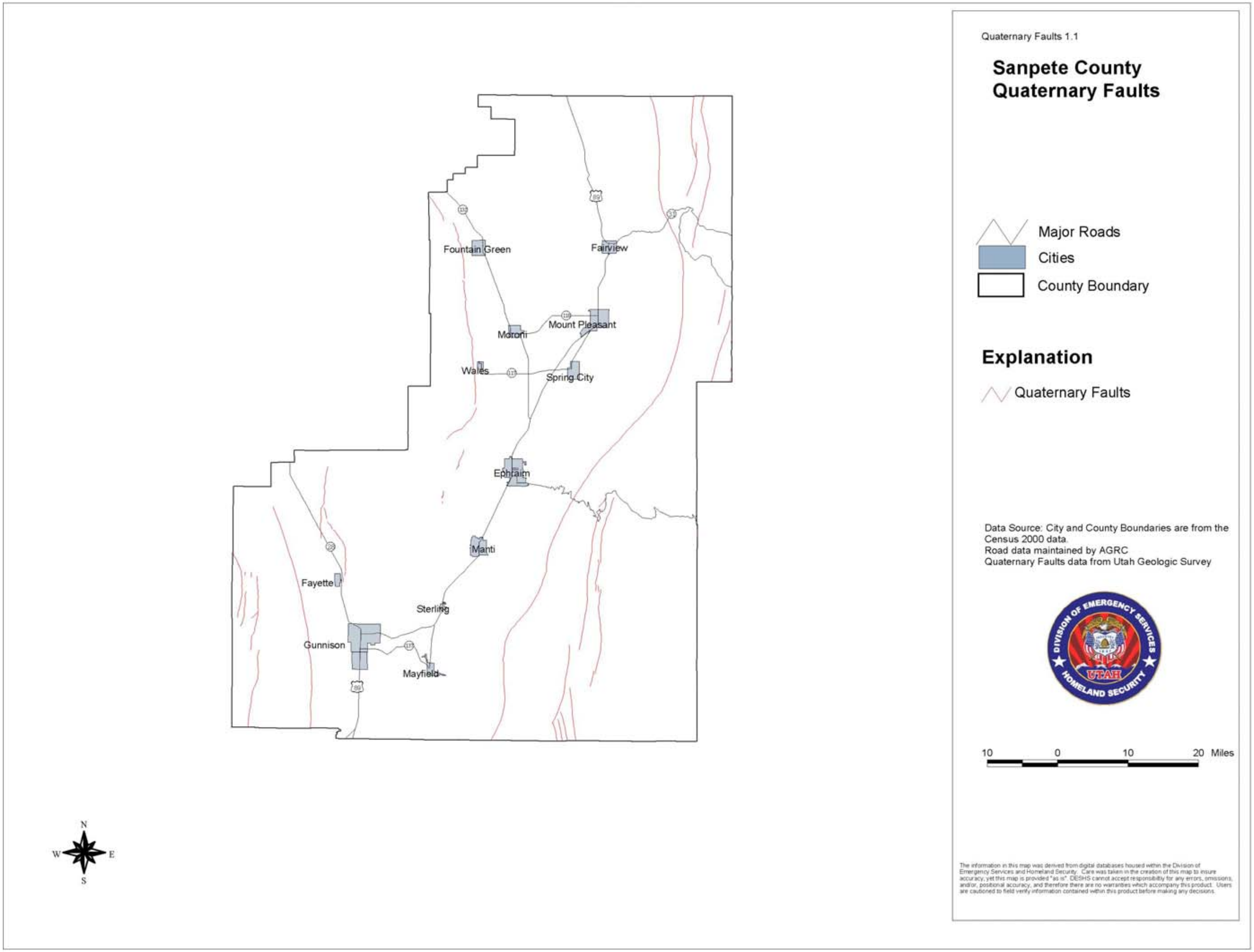
Of the dams located in Sanpete County seven dam are considered a high hazard. A high hazard is defined as a possibility of life being lost due to dam failure. All dams, regardless of rating should be monitored. It should be noted that dam safety hazard classifications are based upon the consequences of dam failure. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure.

The areas of greatest danger to dam failure are south of Ninemile Dam (near Sterling), west of Dairy Dam and Palisades Lake Dam (both near Sterling), south of Fairview Lake Dam (in the mountains east of Fairview), east of Huntington and Rolfson Dams (both in the mountains east of Fairview), and north of Gunnison Dam (near Gunnison). See Map 6.1 on p.28 of this Annex. High hazard dams within Sanpete County are the following (see Table 26):

- Ninemile
- Dairy Dam
- Fairview Lake
- Palisades Lake
- Huntington
- Rolfson
- Gunnison

Table 26: High Risk Dams

Name	Year Completed	Type	Storage Acre Feet	Breach Flow cfs
Dairy Dam	2000	Earth Fill	167	TBD
Fairview Lake	1869	Earth Fill	1949	18000
Ninemile	1900	Earth Fill	3500	57000
Palisades Lake	1899	Earth Fill	780	8000
Huntington	1949	Earth Fill	5616	60000
Rolfson	1934	Earth Fill	900	20000
Gunnison	1889	Earth Fill	18218	24000



Quaternary Faults 1.1
Sanpete County Quaternary Faults
Major Roads
Cities
County Boundary
Explanation
Quaternary Faults
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Quaternary Faults data from Utah Geologic Survey
DIVISION OF EMERGENCY SERVICES
HOMELAND SECURITY
UTAH
10
0
10
20 Miles
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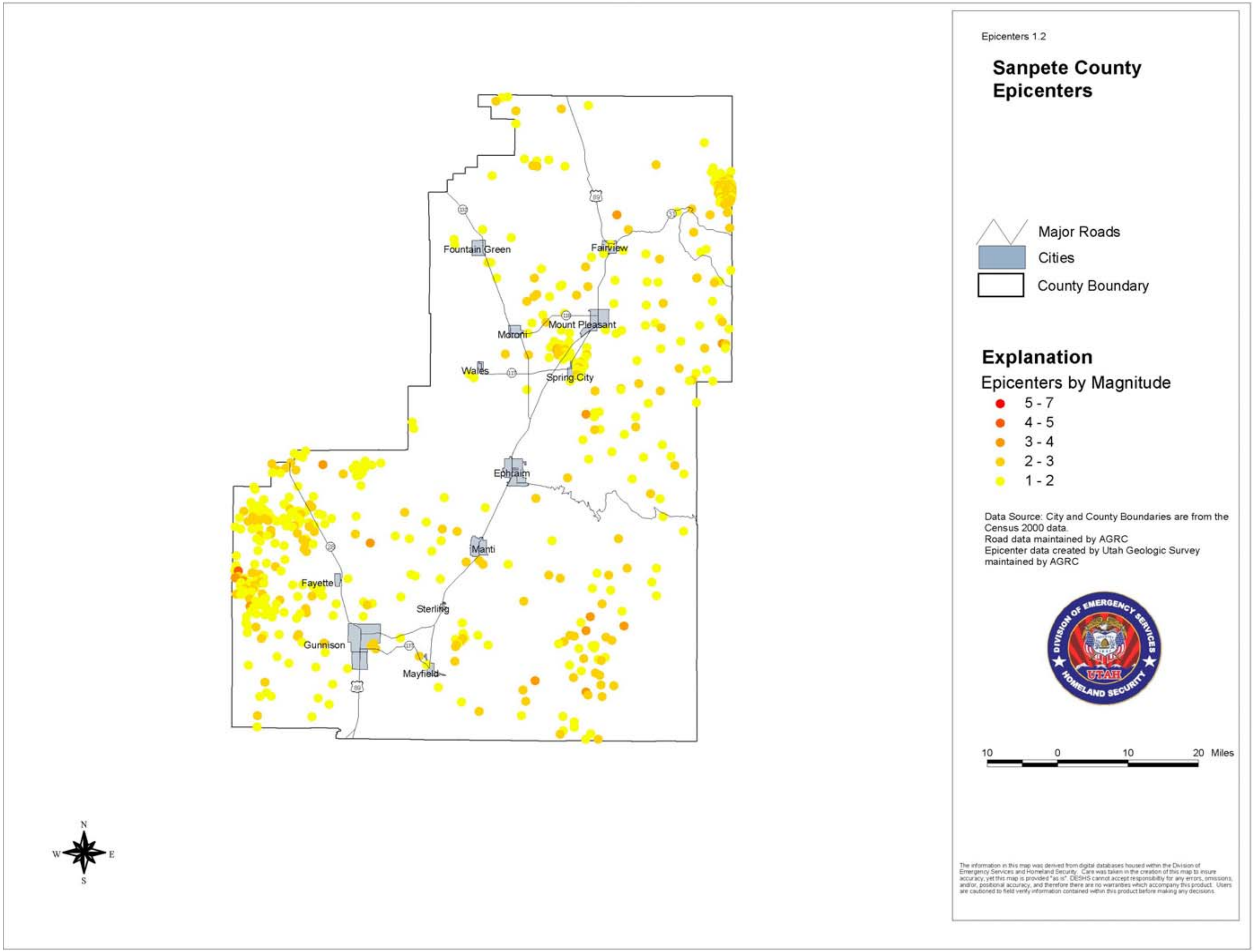
Epicenters 1.2
Sanpete County Epicenters
Major Roads
Cities
County Boundary
Explanation
Epicenters by Magnitude
5 - 7
4 - 5
3 - 4
2 - 3
1 - 2
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Epicenter data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
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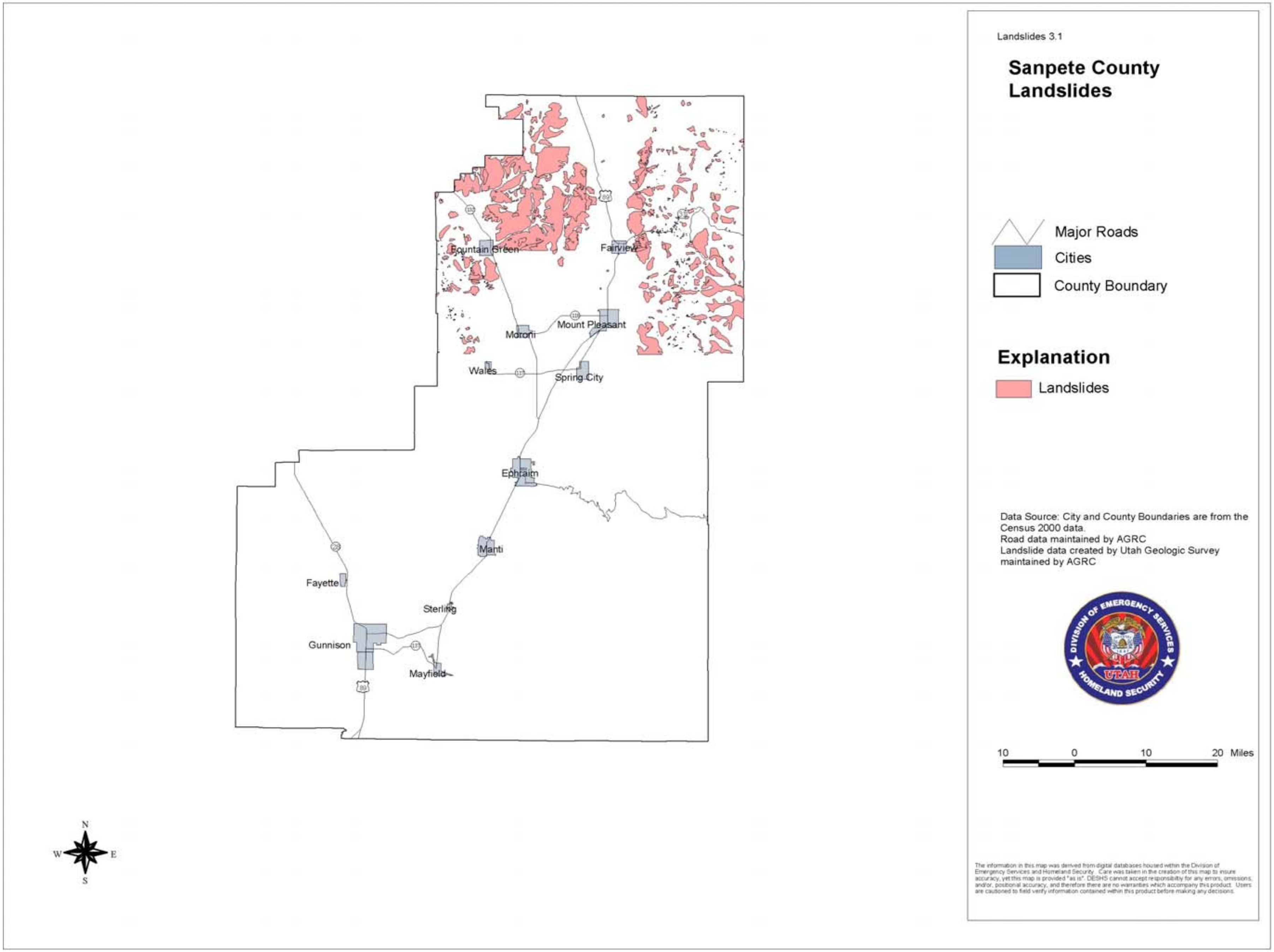

Landslides 3.1
Sanpete County Landslides
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Major Roads
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County Boundary
Explanation
Landslides
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Landslide data created by Utah Geologic Survey maintained by AGRC
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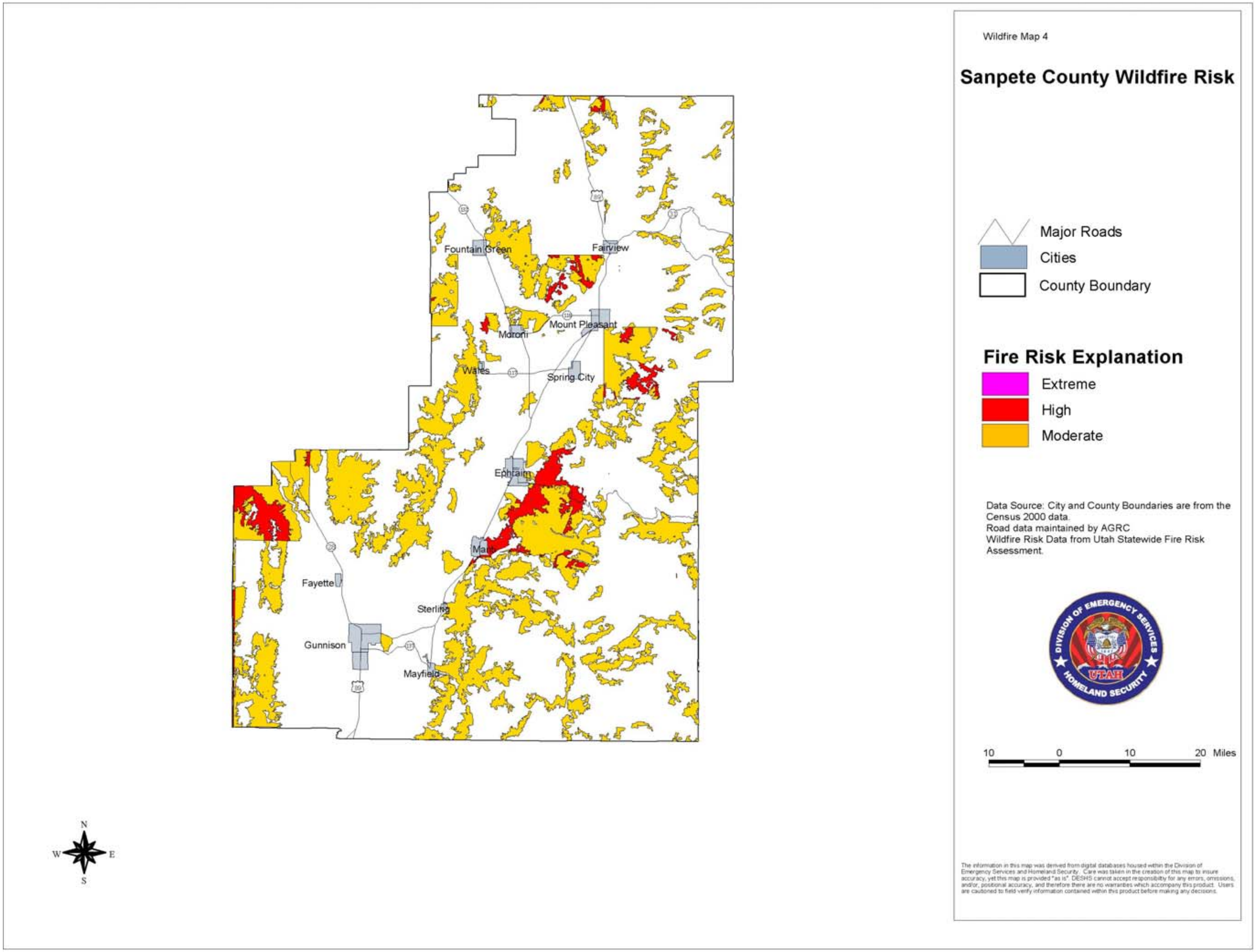

Wildfire Map 4
Sanpete County Wildfire Risk
Major Roads
Cities
County Boundary
Fire Risk Explanation
Extreme
High
Moderate
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Wildfire Risk Data from Utah Statewide Fire Risk Assessment.
DIVISION OF EMERGENCY SERVICES
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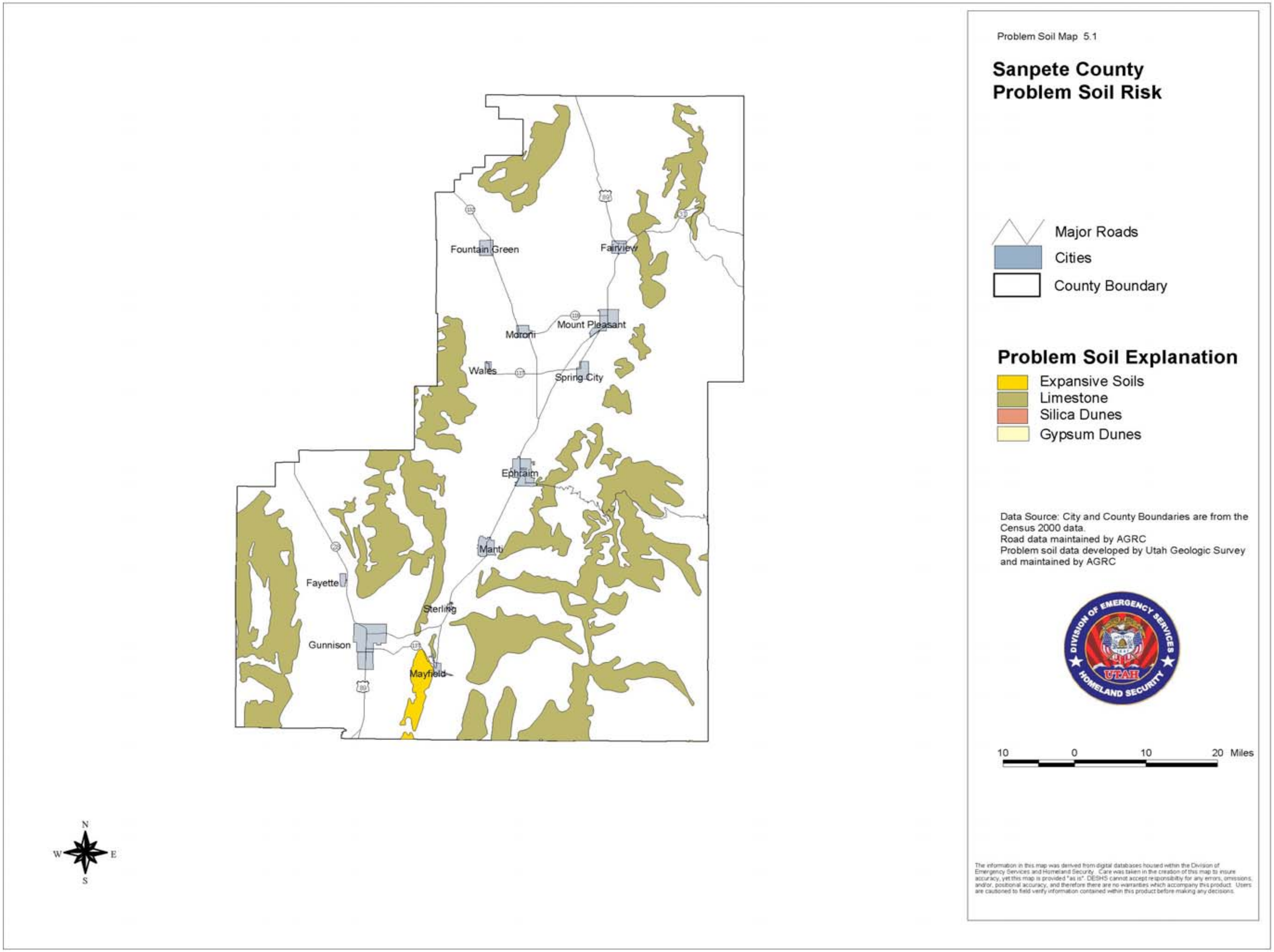
Problem Soil Map 5.1
Sanpete County
Problem Soil Risk
Major Roads
Cities
County Boundary
Problem Soil Explanation
Expansive Soils
Limestone
Silica Dunes
Gypsum Dunes
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Problem soil data developed by Utah Geologic Survey and maintained by AGRC
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The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
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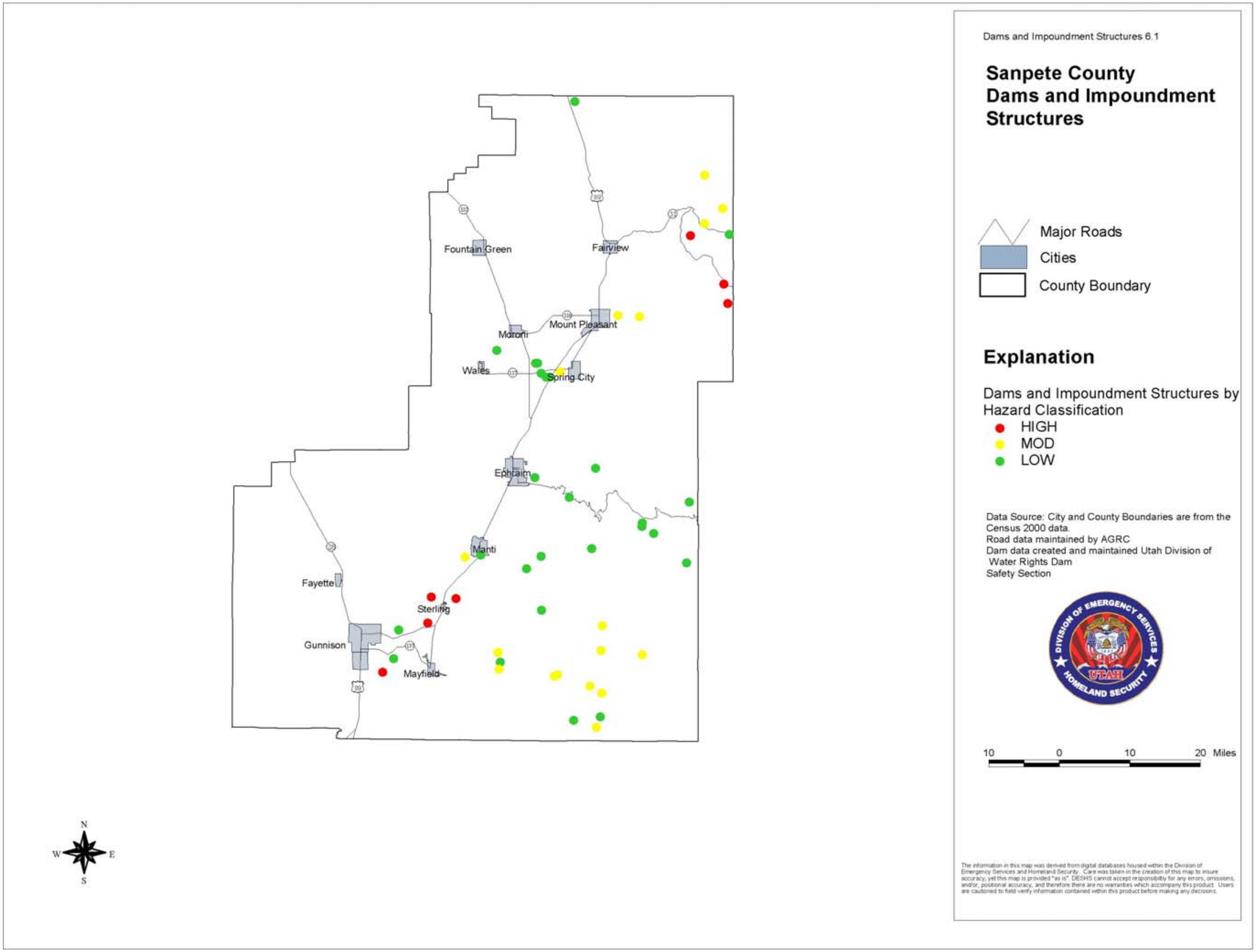
Dams and Impoundment Structures 6.1
Sanpete County
Dams and Impoundment
Structures
Major Roads
Cities
County Boundary
Explanation
Dams and Impoundment Structures by
Hazard Classification
HIGH
MOD
LOW
Data Source: City and County Boundaries are from the
Census 2000 data.
Road data maintained by AGRC
Dam data created and maintained Utah Division of
Water Rights Dam
Safety Section
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
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The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
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MITIGATION CAPABILITIES OF CERTAIN COUNTY AGENCIES

A. Sanpete County Emergency Management

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Coordinate emergency planning and response activities with numerous county agencies. Planning encompasses preparedness, response, recovery, and mitigation.

   b. Responsible for everyday operations of the county’s Emergency Operations Center.

   c. Update and keep Emergency Operations Center at operational readiness.

   d. Update and exercise emergency operations and mitigation plans.

   e. Coordinate state sponsored training for county agencies including; law enforcement, public health, social services, fire departments, emergency medical services, etc.

   f. Coordinate the county’s Local Emergency Planning Committee. (meets eight times annually)

   g. Coordinate the county’s Tier Two reporting. (hazardous materials)

   h. Public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.

   i. Work with schools and local businesses to help create site-specific hazard response plans and present in-service education to local business employees.

   j. Responsible for timely and effective public information releases during emergency situations.

   k. During a disaster declaration, emergency management has all county resources at their disposal including manpower, communications, and equipment.

l. Have verbal and/or written mutual aid agreements with Juab, Millard, Piute, Sevier, and Wayne County Emergency Management Agencies for necessary resources during a disaster situation.

m. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.

n. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

a. In coordination with the Six County Association of Governments, assist with applications for federal and state funding such as the Hazard Mitigation Grant Program.

b. Involved with inspecting hazardous material storage sites and fulfilling Tier Two reporting requirements.

c. Participate in dam inspections with the Army Corp of Engineers.

3. Leadership and coordination with other government agencies:

a. <u>Local Agencies</u>: Sanpete County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include:

Sanpete County Commissioners, Sanpete County Road Operations, Sanpete County Sheriff’s Office, Sanpete County Recorder, Sanpete County Clerk, Sanpete County Building Inspector Operations, Sanpete County Auditor, Emergency Medical Service, Sanpete County Fire Department, Sanpete County Economic Development Office and various other law enforcement, fire, communication, and emergency medical agencies.

b. <u>Non-local Agencies</u>: Sanpete County Emergency Management coordinates with numerous state and federal agencies. These agencies include the Utah Division of Emergency Services and Homeland Security, Utah Highway Patrol, State Health Department, Department of Transportation, Federal Emergency Management Agency, and the Natural Resources Conservation Service.

4. General recommendations/Emergency Management concerns:

   a. Provide listings of eligible mitigation projects so counties can be prepared when funds become available.

   b. Sanpete County is constantly striving to improve planning and exercise activities and response capabilities. However, with the county growing and becoming more industrial, the threat of potential hazards increases, which increases the need for resources, training, and awareness.

   c. County needs to add natural hazard mitigation to the General Plan and to the zoning and subdivision ordinances. Based on funding, Six County Planning Staff will work with the county to update the General Plan and the zoning ordinances to reflect natural hazard mitigation. Existing zoning requirements for flood plain management need to be enforced.

B. <u>Sanpete County Road Operations *</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Design bridges, culverts, and overflow sections. The County Road Operations follows a very detailed list of design standards for all projects within the county.

   b. Continually working with the Department of Transportation on various projects since the DOT dispenses federal funding. While the DOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:

   a. Responsible for and have authority to regulate and inspect all projects completed within the county.

   b. All projects funded by the state or federal government are designed by a consulting engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the consulting engineering company and is overseen by the county to ensure standards are met. Many county projects are designed with in-house expertise and engineers are consulted if problems arise.

c. All funding in one-way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with other government agencies:

   a. Local Agencies: The County Road Operations has little interaction with other county agencies concerning roads and bridges. They do, however, coordinate with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States Attorney's Office. The land values are usually developed by the Tax Equalization Office and approved by the County Commission.

   b. Non-local Agencies: The County Road Operations coordinates with various State and Federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the Utah Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the Utah Historical Society.

4. General recommendations/Emergency Management concerns:

   a. Sanpete County Road Operations should assist local government with floodplain management and water development permitting.

C. Central Utah Public Health

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Central Utah Public Health (CUPH) will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.

   b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.

   c. Programs include; waste water treatment, water pollution, public health nursing, immunization programs, solid waste regulation, food establishment inspections, air quality, and vector control.

2. Responsibility and authority in the regulating, inspecting or funding of projects.

   a. CUPH Health is a unit of state government that operates through agreements or Memorandums of Understanding with the Utah Department of Health to enforce state public health statutes within the Six County district. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: Within the scope of public health, CUPH coordinates with the following local agencies; Sanpete County Emergency Management, local law enforcement agencies (city and county), local school boards, and planning and zoning agencies.

   b. <u>Non-local Agencies:</u> Within the scope of public health, CUPH coordinates with the following agencies; Utah Department of Health and state and federal law enforcement agencies.

4. General recommendations/Emergency Management concerns:

   a. Public Health is normally under funded and understaffed at all levels of government. Should CUPH be called upon for expertise at a time of emergency or disaster, it normally does not have instrumentation for site level determinations of any kind without support from other agencies.

   b. Public health agencies should be included in equipment storage; e.g., FEMA equipment "stored" and used at public health agencies, rather than being stored at a warehouse. For example, radio equipment that belongs to FEMA is based at county emergency management offices; the same could be done with air sampling equipment or other instruments/kits etc., which could be used by public health agencies both for daily work and at a time of emergency or disaster.

D. <u>Sanpete County Sheriff's Office</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Responsible for law enforcement and criminal investigation in unincorporated areas of the county and in smaller towns that do not have police departments.

b. Provide standard law enforcement manpower and equipment.

c. In disaster situations, provide; warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

d. Provide public awareness and educational programs. (911 education, safe kids program, etc.)

e. Have mutual aid agreements with all surrounding counties and the Utah State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

a. None

3. Leadership and coordination with other government agencies:

a. <u>Local Agencies:</u> Within the scope of law enforcement, the Sanpete County Sheriff's Office coordinates with various local agencies. These agencies include Sanpete County Emergency Management and various local police departments.

b. <u>Non-local Agencies:</u> Sanpete County Sheriff's Office coordinates with appropriate state and federal agencies including; Utah Highway Patrol, Utah Attorney Generals Office, Bureau of Criminal Identification, Utah Department of Transportation, and Federal Bureau of Investigation.

4. General recommendations/Emergency Management concerns:

a. None

E. <u>Sanpete Fire District</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

a. Respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.

b. Respond to accidents in order to provide rescue assistance.

c. Assist Emergency Medical Services in providing emergency assistance to sick and injured. (first responders)

d. Provide standard firefighting manpower and equipment.

e. Respond to spills and releases of hazardous materials and assist in mitigating the detrimental human and environmental effects of these occurrences.

f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.

g. Provide training for department members that will enable them to effectively and efficiently carry out their respective duties and responsibilities.

h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.

i. Assist in enforcement of city fire ordinances.

j. Fire investigation.

k. Provide assistance to other jurisdictions, as department resources and commitments allow. Sanpete Fire District has mutual aid agreements with Juab, Millard, Piute, Sevier and Wayne Counties.

l. Inspections and preplanning within the fire district to reduce hazards and aid in fire prevention.

m. Assist with the county's tier two reporting. (Hazardous materials storage sites)

n. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. Local Agencies: In efforts to decrease vulnerability to hazards, the Sanpete Fire District coordinates with various local agencies. These agencies include Sanpete County Emergency Management, Mt Pleasant Police Department, Moroni Police Department, Sanpete County Sheriff's Office, Mt Pleasant Fire Department, Manti Fire Department, Ephraim Fire Department, Gunnison Fire Department, other local police and fire departments, local Public Works, and local Emergency Medical Services.

   b. Non-local Agencies: Utah State Fire Marshal and the Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   Our district has seen an increase in number and variety of calls. As first responders, we have to train and equip our fire departments for various situations that may arise, such as: vehicle extrication, various types of hazardous materials, and many other types of responses. Each added type of response increases the need for equipment and the time our volunteers need to spend in training. With the recent decrease in population in our district, volunteer retention and recruitment is also a concern.

   a. Seek funding outside of the district for additional equipment that will improve the effectiveness of our responses as well as increase the margin of safety for our volunteers.

   b. Explore training options to cover the expanding variety of responses in our district.

   c. Look into recruitment and retention programs that will work in our district.

F. Utah State University Extension Service *

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. The Utah State University Extension Service provides practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.

b. County Extension Agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.

c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage clientele.

d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.

e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.

f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.

g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

a. Authority is at federal level.

3. Leadership and coordination with other government agencies:

a. <u>Local Agencies:</u> Sanpete County Emergency Management and Central Utah Public Health.

b. <u>Non-local Agencies:</u> Utah State University, Utah State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/Emergency Management concerns:

a. None.

OTHER AGENCY RESOURCES

A. Mitigation and risk reduction:

1. Sanpete County Social Services: Temporary assistance to needy families, food stamps, medically needy programs, adult services, homeless assistance, family planning, etc.

2. Army Corps of Engineers: Water and dam management within the county. Provide technical expertise, sandbags, and heavy equipment.

3. Utah Highway Patrol: Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

4. State Fire Marshal: Hazmat route utilization; HAZMAT technical assistance; situation and damage assessment.

5. Forestry, Fire & State Lands: Debris removal from recreational facilities; technical assistance; situation and damage assessment.

6. Utah Division of Wildlife Resources: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

7. State Radio Communications: Exercise readiness of warning systems and communication support.

8. Department of Agriculture: Assists with situation and damage assessment; coordination with USDA; HAZMAT technical assistance; state land use program.

9. Department of Workforce Services: Situation assessment and administration of disaster unemployment assistance programs.

10. Human Services: Insure liaison with private relief agencies for disaster victims.

11. State Historical Society: Project screening and situation assessment.

Annex 6 -- Sevier County

In order to effectively identify and mitigate natural hazards in Sevier County, a Pre-Disaster Mitigation Planning Team representing Emergency Management and each jurisdiction in the county was created. Table 1 names the members of this team. Input from the team was used in organizing hazard mitigation strategies outlined in *Annex 8* and *Appendix T* of this plan.

Table 1: Sevier County Pre-Disaster Mitigation Planning Team

Name	Representing:
Jim Porter, Emer. Mgr.	Sevier County
Doug Peterson, Commissioner	Sevier County
Gary Mason, Commissioner	Sevier County
Ralph Okerlund, Commissioner	Sevier County
Dale Albrecht, Mayor	Annabella
Lawrence Mason, Mayor	Aurora
Valerie Hopper, Mayor	Elsinore
Jake Albrecht, Mayor	Glenwood
Robert Owen, Mayor	Joseph
Harlow Brown, Mayor	Koosharem
Craig Mathie, Mayor	Monroe
Linda Mickelsen, Mayor	Redmond
Woody Farnsworth, Administrator	Richfield
Marilyn Anderson, Mayor	Salina
James Freeby, Mayor	Sigurd
Terry Heath	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Past Hazard Events in Sevier County

Understanding the past is often the key to discovering what the future hold, this is especially true when planning for natural disasters. The fact that cities within Sevier County have experienced, for example, flooding in the past means flooding can occur in the future. While over time some of this has been mitigated for the low frequency of occurrence often results in hazards with little or no mitigation. Table 2 provides a brief history of Sevier County natural disasters. This table includes only sizable events found during our research, and may not represent the total history.

Table 2: Sevier Natural Hazard History

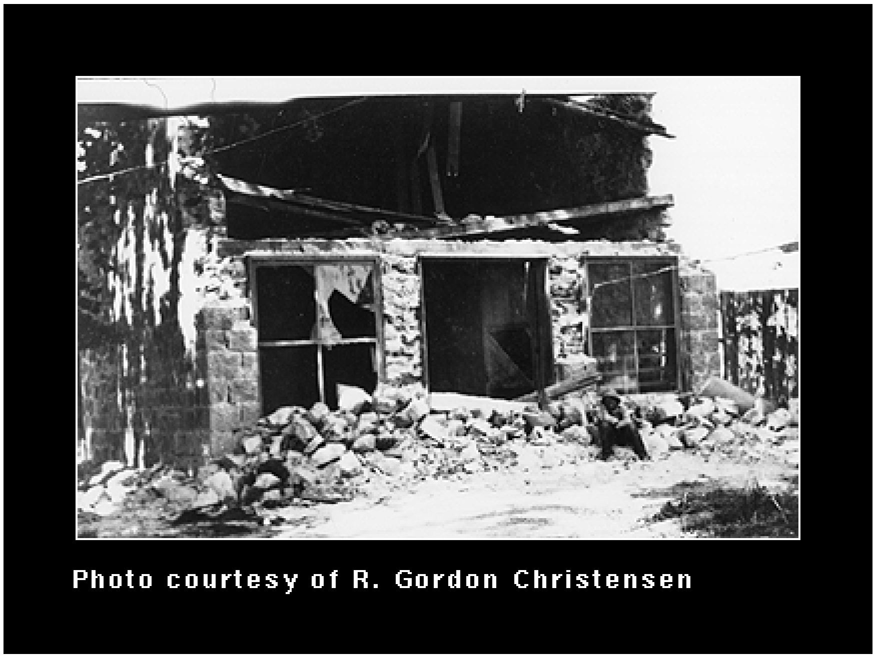
Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood	July 11-17, 1896	Koosharem, Annabella, Elsinore, Joseph, Monroe, Richfield, Sevier, and Sigurd.	Widespread damage	Koosharem inundated.
Flood	1896-1929	Monroe	Unknown	13 floods impacted Monroe over 33-year timeframe.
Flood	July 31, 1943	Monroe	Homes farmlands, crops, and livestock	$80,000 in damage. Canyon on East Mountain
Flood	August 5, 1943	Monroe	Extremely heavy rains damage homes, highways, canals, crops, city pipelines, and power plant.	$120,000 in damage city without power for two weeks
Flood	July 27, 1951	Salina	Property and residential areas	Source was East Canyon.
Flood	September 5, 1960	Glenwood/Sigurd	Roads, bridges, and property	$15,000 plus. Highway 119 and 24 extensively damaged
Flood	July, 31, 1961	Richfield	U.S. 89 damaged along with irrigation canal	Source: Cottonwood Canyon
Flood	August 11, 1961	Richfield	Property damage in northeast section of city.	Source: Cottonwood Canyon. Damage $3,700.

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood	August 15, 1964	Sigurd/Aurora	Crops and irrigation system.	Anderson Wash and Lost Creek, $1,600
Flood	August 17, 1965	Annabella/Glenwood	Crops, farms, roads, and fences.	$38,000 in damage
Flood	August 6, 1967	Richfield/Central	Damage to homes, farms, and crops.	Source: Flat and Cottonwood Canyons. $30,000 in damage.
Flood	July 24, 1968	Richfield	Damage to homes	
Flood	July 30, 1968	Richfield/Elsinore	U.S. 89 covered with debris and water. Farmlands and buildings damaged.	Source: Flat and Cottonwood Canyons.
Flood	August 8, 1968	Richfield	Farmlands and buildings	Source: Cottonwood Creek. $2,000+ in damages.
Flood	July 24, 1969	Redmond/Sigurd	Farmlands and irrigation canals.	
Flood Presidential	1983	Monroe, Richfield, and Salina	Damage in all sectors.	Source Sevier River, Monroe, Cottonwood, and Salina Creek.

Hazards	**Date**	**Location**	**Critical Facility or Area Impacted**	**Comments**
Flood Presidential	1984	County wide	All sectors impacted by event loss to road, culverts, agriculture, sewer, infrastructure, flood controls, etc.	Public assistance totals $185,545 (1984 dollars)
Earthquake	November 13, 1901	Richfield	Considerable damage to city of Richfield.	Richter Magnitude Scale 6.5 with Numerous Aftershocks.
Earthquake	January 10 & 12, 1910	Elsinore	Limited damage.	Richter Magnitude Scale 5.0 with Several Aftershocks.
Earthquake	September 29, 1921	Elsinore	Considerable damage within the region. Damaged Monroe City Hall.	Richter Magnitude Scale 6.3 with Several Aftershocks (see Picture 1 below table).
Earthquake	September 30, 1921	Elsinore	Considerable damage within the region damaged Monroe City Hall.	Richter Magnitude Scale 5.7 with Several Aftershocks (see Picture 1 below table).
Earthquake	October 1, 1921	Elsinore	Considerable damage within the region. Damaged Monroe City Hall.	Richter Magnitude Scale 6.0 with Several Aftershocks (see Picture 1 below table).

Hazards	**Date**	**Location**	**Critical Facility or Area Impacted**	**Comments**
Earthquake	October 27, 1921	Elsinore	Limited damage.	Richter Magnitude Scale 4.3 with Several Aftershocks.
Earthquake	November 18, 1945	Glenwood		Richter Magnitude Scale 5.0
Earthquake	October 4, 1967	Sevier-Piute Boundary near Marysvale	Limited damage. U.S. 89 blocked by rock slide in Marysvale Canyon.	Richter Magnitude Scale 5.2
Earthquake	January 3, 1972	Richfield	Cracked walls and ceilings and broke dishes and light fixtures.	Richter Magnitude Scale 4.4
Earthquake	June 2, 1972	Monroe		Richter Magnitude Scale 4.0
Severe Weather	August 7, 1957	Salina	Damage to turkey farm roof, uprooted trees, downed power lines, and telephone lines	Tornado
Severe Weather	April 18, 1970	Annabella	Home damage	Tornado
Wildfire	1997	Flat Fire		5,505 Acres

(Source: History of Sevier County, Utah State Historical Society.)

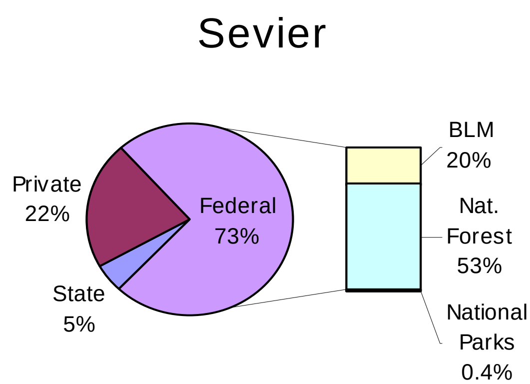


Picture 1: Elsinore Earthquake, 1921

Development Trends

Approximately 294,902 acres or 22% of the total land area in Sevier County is privately held and outside the incorporated areas is mostly vacant. The other 78% is owned by the state or federal governments and aside from extractive industry is beyond the reach of development. Since land ownership determines how and where development proceeds, Figure 1 helps explain Sevier County's development trends.

Figure 1: Sevier Land Ownership



The vast majority of landslides, debris flows and wildfires occur on these public lands with virtually no impact on development. Of the privately held land, most is not developable due to a lack of water and county zoning requirements of water access and a minimum of 40 acres per house in much of the county. Other limitations to development include steepness of the terrain, flash flood plains and accessibility. There is still plenty of infill within city limits that can be utilized for safe development without developing in unincorporated, sparsely populated, or hazardous areas. Sevier County requires UBC on all new or proposed buildings. New subdivisions require a grading and drainage plan to mitigate any flooding, which may occur. Since most of the privately held land is along the relatively safe I-70 corridor from Salina to Joseph, development is occurring in this general area. Currently, a rail road spur is being considered for development in the county adjacent to the town of Redmond and Salina City. A power plant south of Sigurd is also in planning and feasibility stages of development. A large box retail development within the Richfield's jurisdiction is in its final phase of completion. These projects are construed as large and major developments within the county.

Historically and today, agriculture plays a huge part in the economy of the county. As the largest city in the region and due to its central location, Richfield (pop. 7,020) plays host to several state and federal agencies. Situated along I-70 and US 89, Richfield has seen most of the county's recent growth. Transportation development had its beginnings in the original wagon trails, which brought the pioneers to this area. Later roads and US 89 followed this north-south route. I-70 partially follows this corridor in the populated areas of the county, but essentially runs east to west on the fringes. This corridor is where future development is likely to happen because of the private lands along this major transportation artery. Except for lands adjacent to the Sevier River and its tributaries, this corridor is relatively safe from natural hazards.

1. Earthquake

Table 3: FEMA Hazard Profile for Earthquake in Sevier County

Frequency	Possible
Severity	Catastrophic
Location	Ground shaking will be felt throughout the entire county if a large earthquake were to occur. Surface fault rupture could be expected in areas of known historic fault movements. Liquefaction is expected in areas of high to moderate liquefaction potential, which covers a vast portion of the Sevier Valley.
Seasonal Pattern	None
Duration	Actual ground shaking will be under one minute yet after shocks may occur for weeks after.
Speed of Onset	No warning

Description of Location and Extent

The Six County region's earthquake threat from the Intermountain Seismic Belt and other crustal rock strain release areas is high; although there is limited risk to population due to the large areas of undeveloped lands those living in the region are at an elevated risk. During historic time the largest recorded earthquake in Sevier County has reached 6.7 on the Richter magnitude scale. Several large events have occurred in the recent past in the 5.5 to 6.3-magnitude range. These events are associated with numerous faults, which exhibit signs of prior movement during the quaternary time period or the last 1.6 million years. These faults are listed in Table 4 (see Maps 1.1 and 1.2 starting on p.22 of this Annex).

Table 4: Fault Lines Movement

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Sevier fault (northern portion)	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Maple Grove faults	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Maple Grove faults	Late Quaternary (<130,000 years)	< 0.2 mm/yr	Simple
Japanese and Cal Valleys faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Valley Mountains monocline	Quaternary (<1,600,000 years)	NA	Suspected
Wasatch monocline	Quaternary (<1,600,000 years)	NA	Suspected
White Mountain area faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Southern Joes Valley fault zone	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Southern Joes Valley fault zone	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Joseph Flats area faults and syncline	Late Quaternary (<130,000 years)	< 0.2 mm/yr	Suspected
Joseph Flats area faults and syncline	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Suspected
Elsinore fault (fold)	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Red Canyon fault scarps	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Annabella graben	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Simple
Annabella graben	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Dry Wash fault and syncline	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Dry Wash fault and syncline	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Koosharem fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Thousand Lake fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple

HAZUS MH Vulnerability Assessment

HAZUS-MH was used to determine vulnerability to earthquakes in the Six County planning area. Tables 5-9 are a summary of results from the HAZUS MH model. Damage and loss estimates are based on a 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete Sevier County HAZUS MH run is available in *Appendix O.*

Number of people

Whether an earthquake occurs at night, during the day, or during a commute plays a significant role in estimating the number of casualties as outlined in Table 5.

Table 5: Casualties

Casualties	Nighttime –Minor	119
	Nighttime –Major	3
	Nighttime -Fatalities	5
	Daytime –Minor	135
	Daytime –Major	5
	Daytime- Fatalities	9
	Commute –Minor	115
	Commute –Major	4
	Commute-Fatalities	7

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 6 lists the number of buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 6: Building Damage by Count with Moderate to Complete Damage

Category	Number of Structures*	Total Cost in millions of dollars **
Residential	490	118.04
Commercial	35	30.25
Industrial	4	6.37
Totals	2,815*	158.59**

***Includes all building categories with moderate to complete damage**
** Structural, non-structural, content, inventory

Infrastructure Types and Amounts
Table 7 shows which critical facilities will receive damage and how much damage will result.

Table 7: Critical facilities

Classification	Total	Least Moderate Damage >50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	1	0	0	1
Schools	17	0	0	0
EOCs	0	0	0	0
Police Stations	3	0	0	0
Fire Stations	2	0	0	0

Debris Removal –Table 8 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space. Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 8: Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	102
Loads (25 tons per load)	4,080

Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 9 provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 9: Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	2
People Displaced	0
Value Exposed (thous. $)	23

2. Floods

Table 10: FEMA Hazard Profile for Floods in Sevier County

Frequency	Likely
Severity	Limited
Location	Flooding would occur in and along flood plains.
Seasonal Pattern	Sevier County's main flooding threat is from snowmelt runoff during spring months.
Duration	The type of event determines the duration of flooding; flooding due to summer thunderstorms can last a couple of hours where as flooding due to spring runoff can last weeks.
Speed of Onset	Six to twelve hours.

Description of Location and Extent
Based on the flooding which occurred during the spring of 1983 and 1984 both as a result of rapid snow melt events, experience would suggest these events would appear to be a greater hazard than cloudburst storms. Yet serious hazards could result from either storm. Sevier County is vulnerable to flooding from the Sevier River and its tributaries, Peterson Creek, Cottonwood Creek, and Monroe Creek. In addition to the natural stream channels a plethora of canals have been constructed for irrigation. As county populations continue to grow farmlands near the cities are being converted to residential development. The following canals present a problem for current and future development: Rocky Ford Canal, Spring Ditch, West View Canal, Richfield Canal, Venice Canal, and Koosharem Canal. Several canals such as the Richfield Canal cross alluvial fans. There has been discussion of a debris flow damaging the canal which in turn could cause damage to homes and the freeway.

Description of type
Precipitation in Sevier County originates from two major sources. Moisture laden polar pacific air entering the area from the west or northwest during the winter produces large general storms, which most often result in heavy snowfall in the upper elevations and either snowfall or moderate intensity rainfall in the lower elevations.

The second major source of precipitation in the area arises from tropical air masses entering from the south and southwest out of the Gulf of Mexico during the summer months. Often wrongly referred to as monsoons these air masses cause high intensity convective cloudburst storms, which are augmented by the orthographic lifting which occurs as the air mass passes over neighboring mountains.

Precipitation from these two types of storms can produce flash floods, snowmelt floods, post wildfire/damaged watershed floods, and severe winter weather.

Note on Vulnerability Assessment
At this time, data was insufficient to conduct a risk analysis for flood events in Sevier County. Flood Insurance Studies were study were applicable to aid in determining risk. However, the current mapping projects being led by the county and state will result in better data that will assist in understanding risk. As part of its efforts to mitigate hazards and protect lives and property from the devastating effects of natural disasters, FEMA aims to provide individuals, businesses, and communities with information and tools to work proactively to mitigate hazards and prevent losses resulting from disasters. One of these tools is the new HAZUS MH flood model. Unfortunately at the current time this model does not work well enough to complete loss numbers for each jurisdiction in the county.

The U.S. Army Corps of Engineers wrote a Flood Hazard Identification Study (see *Appendix N)* which is included in the flood mitigation goals found in *Annex 8* and *Appendix T* of this plan. This study looks predominately at jurisdictions which are unmapped or mapped as D zones by the National Flood Insurance Program.

3. Landslides

Table 11: FEMA Hazard Profile for Landslides in Sevier County

Frequency	Likely
Severity	Negligible
Location	Mass wasting in Sevier County is located predominately along the canyons east and west of the Sevier Valley (see map 3.1 on p.24 of this Annex).
Seasonal Pattern	Landslides most often occur within Sevier County during spring months with higher than normal amounts of precipitation.
Duration	Several months
Speed of Onset	No warning

Description of Location and Extent
The map "Sevier County Landslide Map 3.1" shows the locations of potentially active landslides, and identifies historical landslides and their locations. Landslides are generally located in well-defined, localized areas, but when they occur is usually unpredictable. The impact of a landslide can be countywide.

Several areas in the county are at risk to landslides. The cities of Elsinore, Glenwood, Monroe, and particularly Richfield have a significant amount of land classified as historically active.

Tables 12 and 13 show the number of acres and households at risk from landslides. The extent and cost of damage to roads and electric infrastructure are shown in Tables 14 and 15, respectively.

Table 12: Landslide Acres

County Name	Acres of Active landslides	Historically Active Landslides 1847 to Present
Sevier	1,394	373,643

Table 13: Structure Loss and Value as a Percentage of Total Acreage

City Name	Acres of Historically Active Landslides 1847 to Present	Households Vulnerable to Landslide/Cost*
Elsinore	81	29/2,610,000
Glenwood	23	10/900,000
Monroe	68	21/1,890,000
Richfield	708	488/43,920,000
Salina	23	5/450,000

*Includes value of land.

Table 14: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	368.5	889,374,750
State Route 25	.6	1,448,100
State Route 70	.5	1,206,750
State Route 72	4.7	11,343,450
State Route 119	2.2	5,309,700
State Route 263	.2	482,700
US Highway 89	.3	724,050
Interstate I-70	8.6	20,756,100

Table 13 data represents total lengths of roads, which overlay historically active landslides.

Railroads

This vulnerability analysis using best available data found no railroad track at risk in Sevier County.

Table 15: Electric Infrastructure

Name	Description	Estimated Cost
Sevier Substation	115 KV	10,000,000
Richfield Substation	115 KV	10,000,000
Elsinore Substation	115 KV	10,000,000
Winkleman Substation	115 KV	10,000,000
KV-46	35.3 Miles	1,704,000
KV-138	18.3 Miles	885,000
KV-230	10.6 Miles	510,000
KV-345	22.6 Miles	1,092,000
County lines	3.3 Miles	159,0000

4. Wildfire Risk

Table 16: FEMA Hazard Profile for Wildfire in Sevier County

Frequency	Likely
Severity	High in the Urban-Wildland Interface.
Location	Entire county except cultivated grounds.
Seasonal Pattern	Most wildfires affecting Sevier County occur during mid to late summer months (fire season).
Duration	The amount of time needed to contain a wildfire depends on a variety of uncontrollable variables such as: wind speed, relative humidity, type, and moisture content of fuel, weather, and topography. Thus containment time varies for each fire.
Speed of Onset	0 to 6 hours is the minimum amount of time given to homeowners in order to evacuate.

Description of Location and Extent
The Division of Emergency Services and Homeland Security augmented a statewide wildfire database to represent wildfire vulnerability into five categories: Extreme, High, Medium, Low, and Very Low. These ratings cover all of Sevier County and are based on the type and density of vegetation in each area. Additional factors influencing wildland fires such as weather conditions, wind speed and direction are not considered in this risk assessment.

Annabella, Glenwood, Monroe, and Richfield all have areas in or around them classified as having extreme wildfire risk. Glenwood and Annabella are adjacent to large amounts of extreme wildfire risk area on there eastern boundaries. Both towns are aware of the risk and are working with high-risk neighborhoods.

See Map 4.1 on p. 25 of this Annex for a visual display of location and severity of wildfire risk in Sevier County. Tables 17-20 show the number of acres and households at different levels of wildfire risk in Sevier County.

Table 17: Acres at Risk in Unincorporated County

County Name	Acres of Extreme	Acres of High	Acres of Moderate	Acres of Low/Very Low
Sevier	11,705	107,647	336,698	772,398

Table 18: Households at Risk in Unincorporated County

County	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Sevier	67/4,824,000	617/44,424,000	1,929/138,888,000

Table 19: Acres at Risk in Incorporated Sevier County

City Name	Acres of Extreme	Acres of High	Acres of Moderate
Annabella	53	None	None
Aurora	None	None	None
Elsinore	None	127	None
Glenwood	56	None	None
Joseph	None	None	None
Koosharem	None	None	72
Monroe	35	690	70
Redmond	None	None	None
Richfield	54	763	27
Salina	None	None	1383
Sigurd	None	1	None

Table 20: Structures in Wildfire Area

City Name	Households in Extreme/Cost*	Households in High/Cost*	Households in Moderate/Cost*
Annabella	30/2,160,000	None/0	None/0
Aurora	None/0	None/0	None/0
Elsinore	None/0	45/3,240,000	None/0
Glenwood	25/1,800,000	None/0	None/0
Joseph	None/0	None/0	None/0
Koosharem	None/0	None/0	27/1,944,000
Monroe	11/792,000	216/15,552,000	21/1,512,000
Redmond	None/0	None/0	None/0
Richfield	37/2,664,000	526/37,872,000	19/1,368,000
Salina	None/0	None/0	308/22,176,000
Sigurd	None/0	None/0	None/0

*Excludes content value, which would result in an increase of 50% to the values listed.

Tables 21-23 show extent and cost of wildfire risk to roads, railroads, and electric infrastructure in Sevier County.

Table 21: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	1,364.4	3,292,979,400
State Route 24	27.5	66,371,250
State Route 62	6.2	14,963,700
State Route 70	12.9	31,134,150
State Route 72	23.3	56,234,550

Name	Miles	Estimated Cost
State Route 119	6.5	15,687,750
State Route 263	.6	1,448,100
US Highway 89	.6	1,448,100
Interstate I-70	82.1	198,148,350

Table 21 data includes road lengths within areas determined to have an extreme, high, or moderate risk to wildfire as determined by the Utah Statewide Fire Risk Assessment.

Table 22: Railroads

Railroad	Miles	Estimated Cost
Railroad	.6	1,440,000

Table 23: Electric Infrastructure

Name	Description	Estimated Cost
Sigurd Substation	230 KV	20,000,000
Sevier Substation	115 KV	10,000,000
U.S. Gypsum Substation	115 KV	10,000,000
Richfield Substation	115 KV	10,000,000
Winkleman	115 KV	10,000,000
KV-46	62.8 miles	3,030,000
KV-69	2 miles	96,000
KV-138	27.6 miles	1,323,000
KV-230	23.1 miles	1,116,000
KV-345	39.7 miles	1,917,000
County lines	5 miles	240,000

5. Problem Soils

Table 24: Hazard Profile for Problem Soils in Sevier County

Frequency	Likely
Severity	Negligible (10-25% of jurisdiction affected)
Location	Typically occur at the Valley's boundary with foothills.
Seasonal Pattern	None
Duration	Problems associated with soils last for long periods of time.
Speed of Onset	More than 24 hour warning time.

Description of Location and Extent
The greatest hazards from problem soils are Gypsum Dunes north of Richfield and Expansive Soils south of Salina (see Map 5.1 on p.26 of this Annex). Most problems soils in the area have been mitigated for during construction of buildings.

6. Dam Failure

Table 25: Hazard Profile for Dam Failure

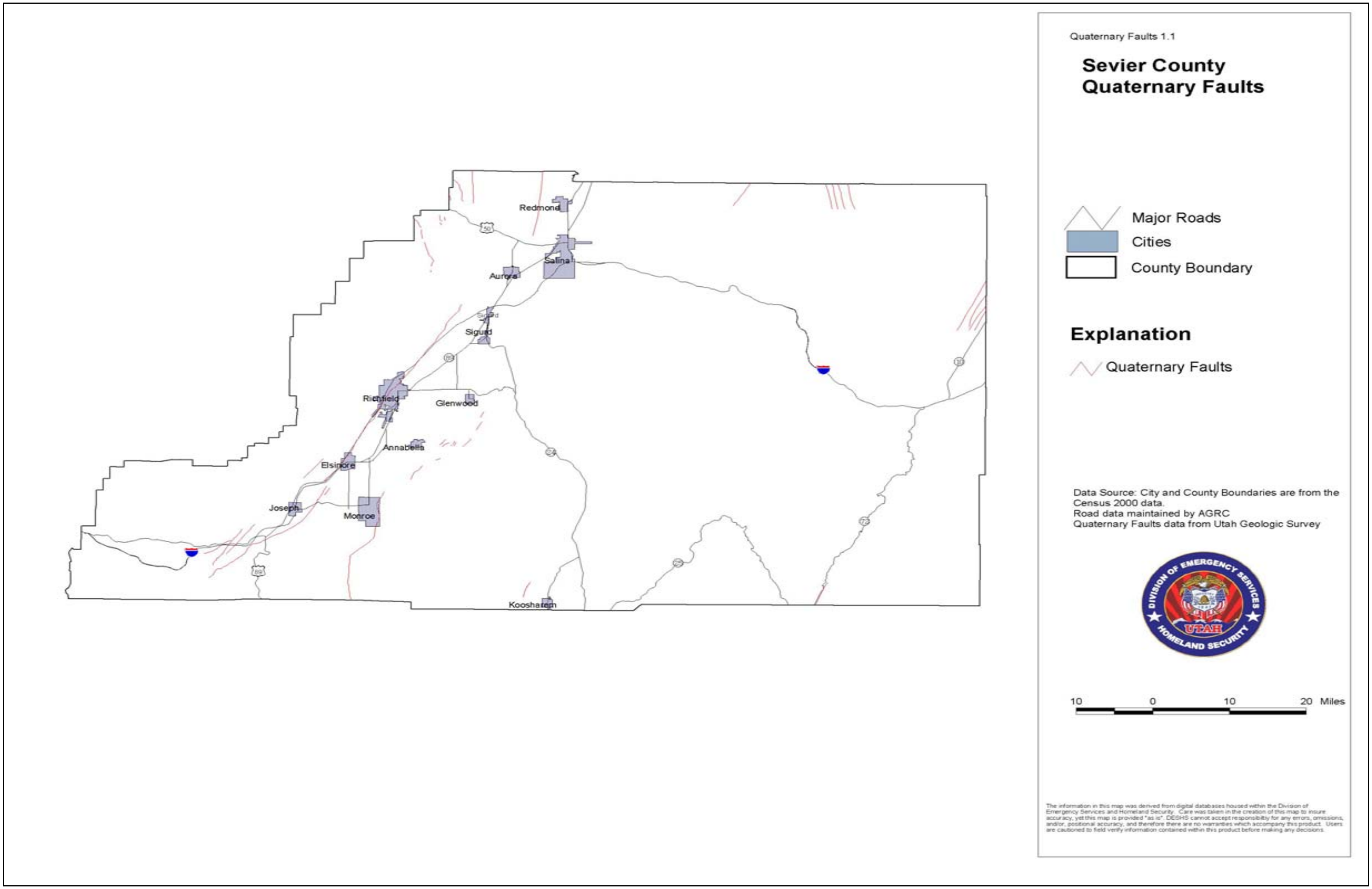
Frequency	Possible
Severity	Limited
Location	Would occur downhill from existing dams.
Seasonal Pattern	None
Duration	Depends on dam and type of break; Could be a wall of water which passes through in a few hours, or a slower break which could last for weeks.
Speed of Onset	6 to 12 hours.

Description of Location and Extent
Of the dams located in Sevier County only nine dams are considered a high hazard. A high hazard is defined as a possibility of life being lost due to dam failure. All dams, regardless of rating should be monitored. It should be noted that dam safety hazard classifications are based upon the consequences of dam failure. Therefore, the classification of a high hazard dam does not mean that the dam has a high probability of failure. The areas of greatest danger to dam failure are east of Cottonwood Wash Detention Basin and Dairy Canyon Detention Basin (both near Richfield), west of Glenwood Debris Dam (near Glenwood), east of Koosharem Dam (near Koosharem), north of Rocky Ford Dam (near Sigurd), and south of Forsyth, Johnson, Three Creeks, and Sand H Debris Dams (all in lightly populated eastern Sevier County). See Map 6.1 on p.27 of this Annex. High hazard dams within Sevier County are the following (see Table 26):

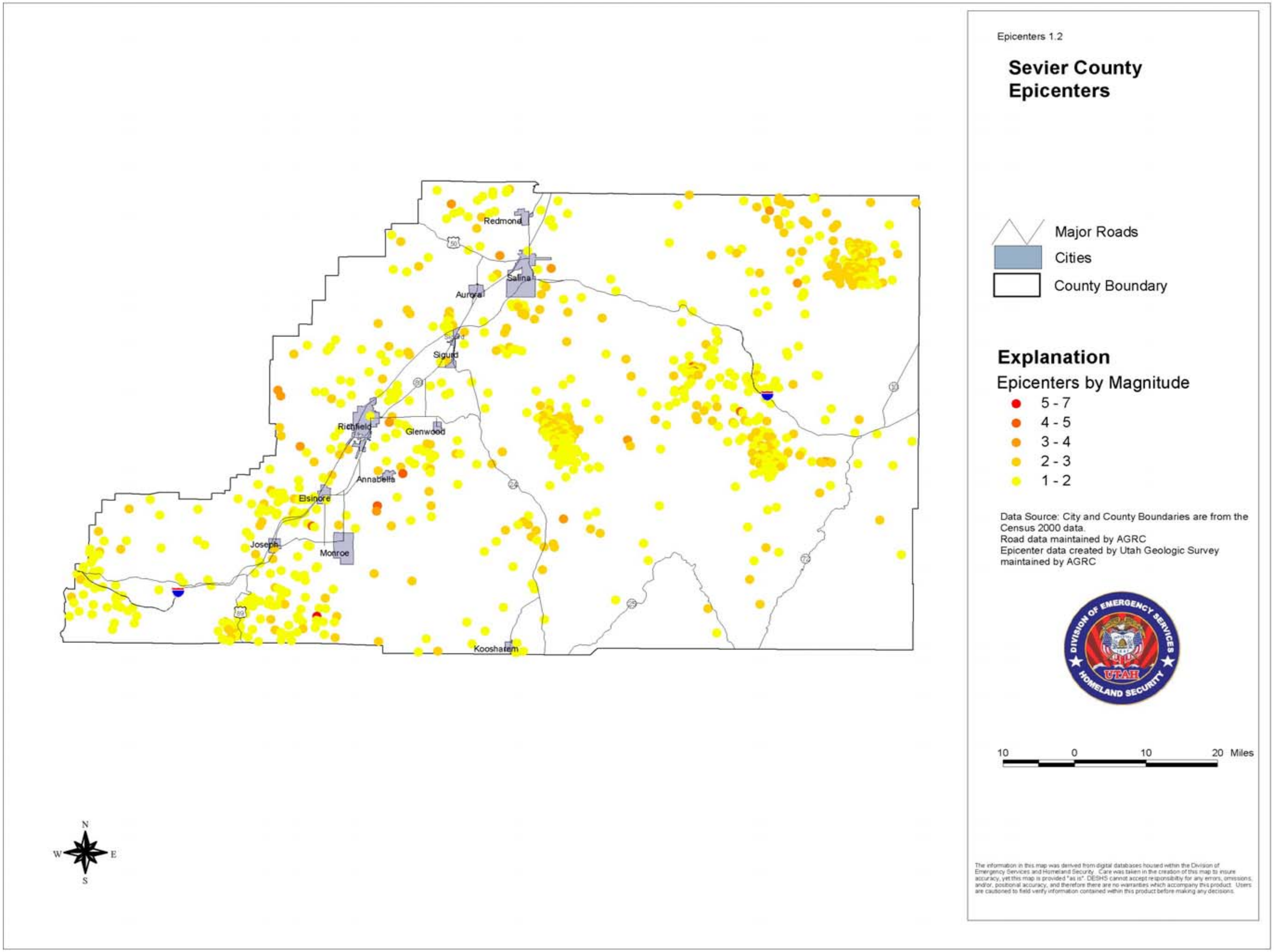
- Forsyth
- Cottonwood Wash Detention Basin
- Dairy Canyon Detention Basin
- Glenwood Debris
- Johnson
- Rocky Ford
- Three Creeks
- Koosharem
- Sand H Debris

Table 26: High Risk Dams

Name	Year Completed	Type	Storage Acre Feet	Breach Flow cfs
Forsyth	1922	Earth Fill	3715	49000
Cottonwood Wash Detention Basin	1986	Earth Fill	695	24000
Dairy Canyon Detention Basin	1987	Earth Fill	110	6000
Glenwood Debris	1956	Earth Fill	200	12000
Johnson	1910	Earth Fill	10350	16000
Rocky Ford	1906	Earth Fill	1700	2000
Three Creeks	1884	Earth Fill	1000	7000
Koosharem	1919	Earth Fill	3858	11000
Sand H Debris	1971	Earth Fill	80	9000



Quaternary Faults 1.1
Sevier County
Quaternary Faults
Major Roads
Cities
County Boundary
Explanation
Quaternary Faults
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Quaternary Faults data from Utah Geologic Survey
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10
0
10
20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Redmond
Salina
Aurora
Sigurd
Richfield
Glenwood
Annabella
Elsinore
Joseph
Monroe
Koosharem


Epicenters 1.2
Sevier County Epicenters
Major Roads
Cities
County Boundary
Explanation
Epicenters by Magnitude
5 - 7
4 - 5
3 - 4
2 - 3
1 - 2
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Epicenter data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
HOMELAND SECURITY
UTAH
10 0 10 20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
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Glenwood
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Elsinore
Joseph
Monroe
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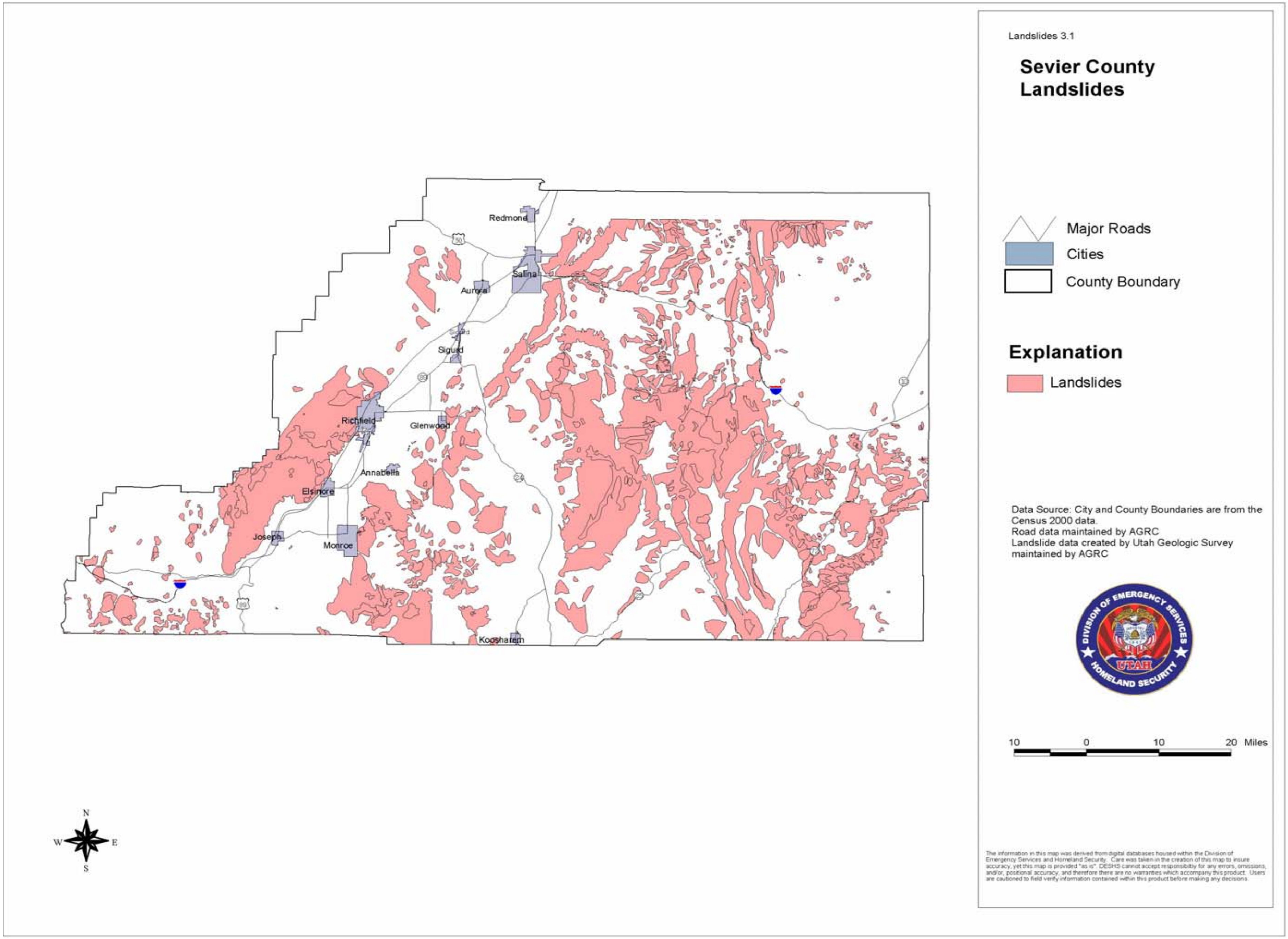

Landslides 3.1
Sevier County Landslides
Major Roads
Cities
County Boundary
Explanation
Landslides
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Landslide data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
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The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
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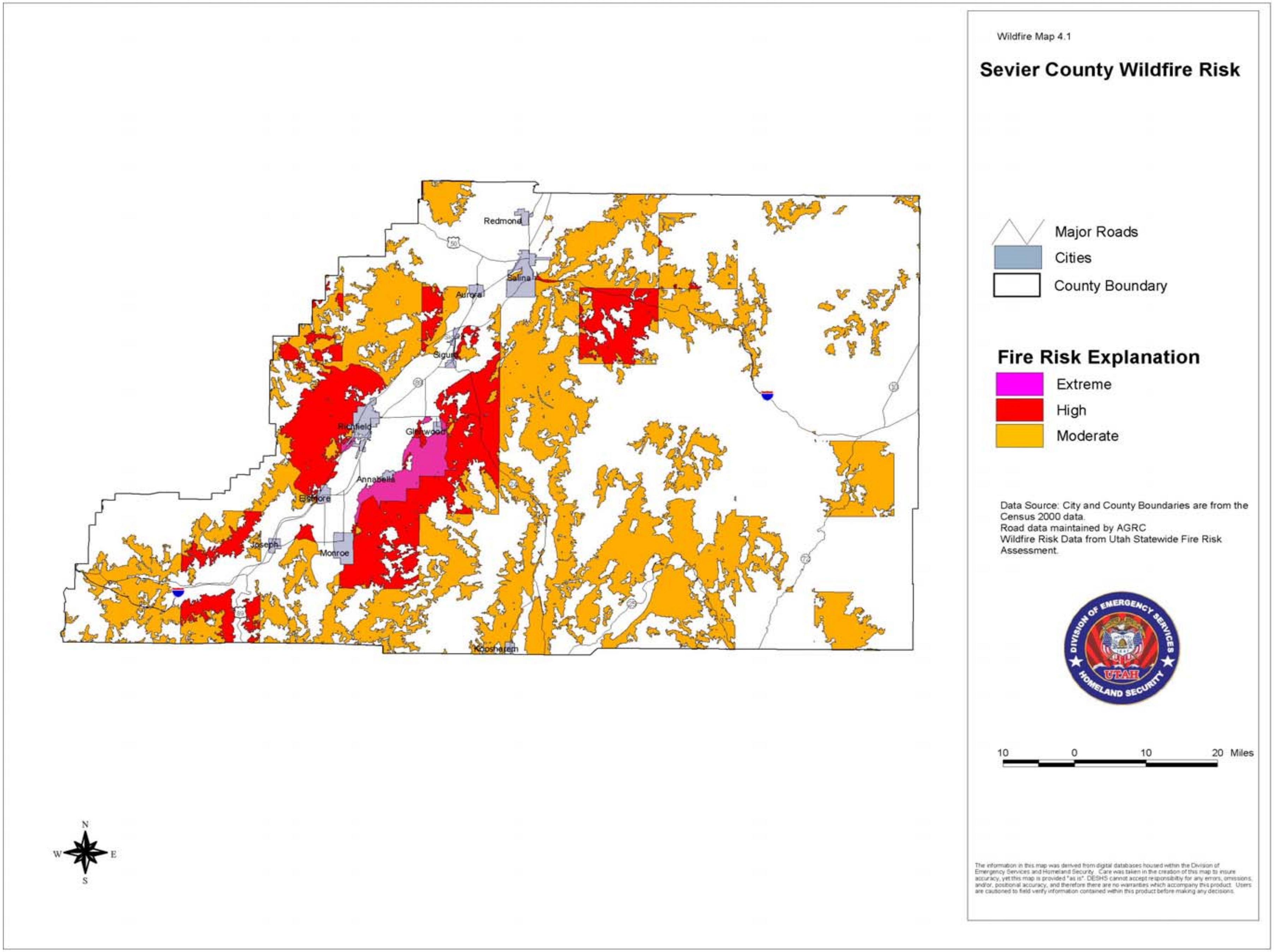

Wildfire Map 4.1
Sevier County Wildfire Risk
Major Roads
Cities
County Boundary
Fire Risk Explanation
Extreme
High
Moderate
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Wildfire Risk Data from Utah Statewide Fire Risk Assessment.
DIVISION OF EMERGENCY SERVICES
HOMELAND SECURITY
UTAH
10
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20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Redmond
Salina
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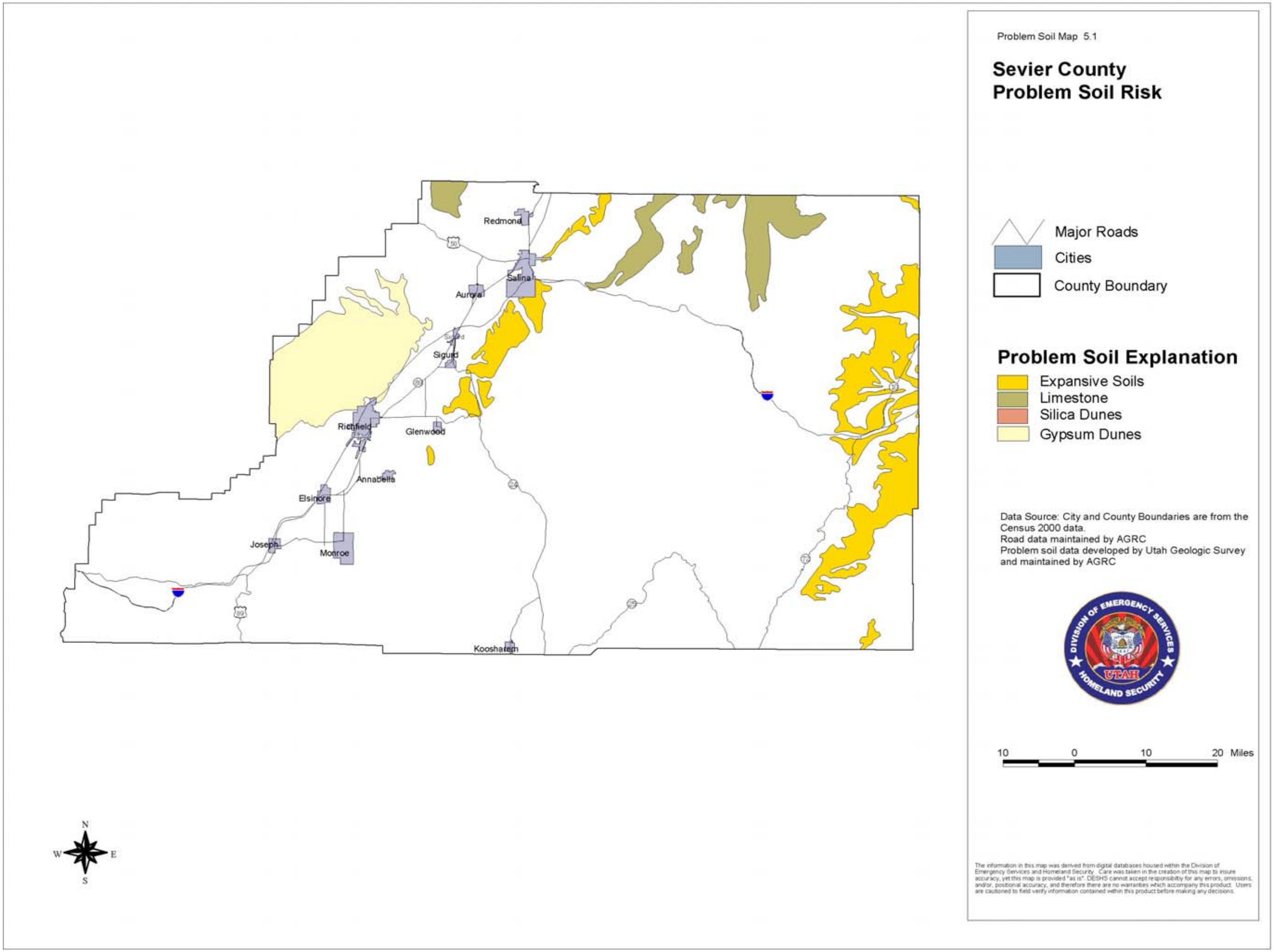
Problem Soil Map 5.1
Sevier County
Problem Soil Risk
Major Roads
Cities
County Boundary
Problem Soil Explanation
Expansive Soils
Limestone
Silica Dunes
Gypsum Dunes
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Problem soil data developed by Utah Geologic Survey and maintained by AGRC
10 0 10 20 Miles
Redmond
Salina
Aurora
Sigurd
Richfield
Glenwood
Annabella
Elsinore
Joseph
Monroe
Koosharem
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S
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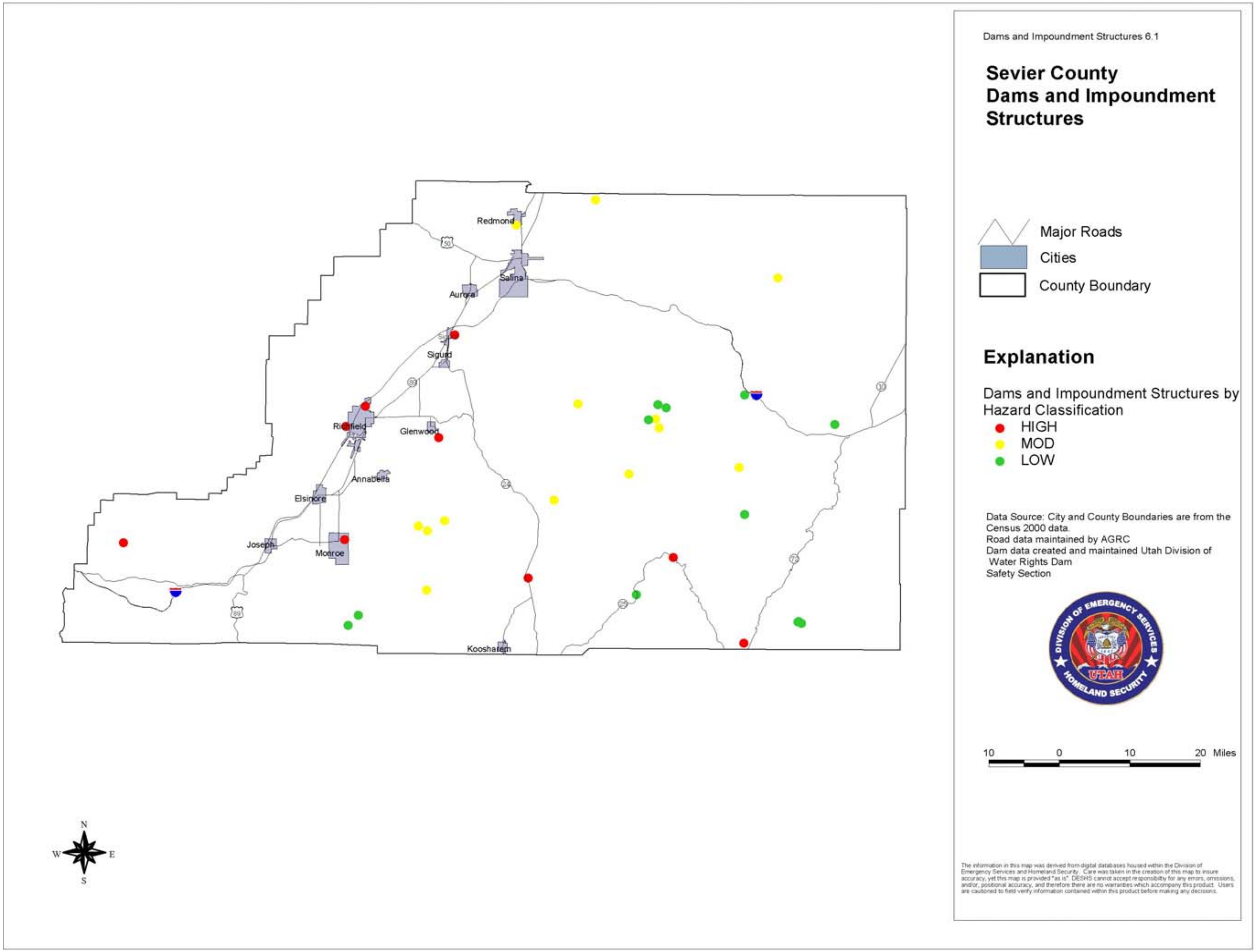
Dams and Impoundment Structures 6.1
Sevier County
Dams and Impoundment
Structures
Major Roads
Cities
County Boundary
Explanation
Dams and Impoundment Structures by
Hazard Classification
HIGH
MOD
LOW
Data Source: City and County Boundaries are from the
Census 2000 data.
Road data maintained by AGRC
Dam data created and maintained Utah Division of
Water Rights Dam
Safety Section
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
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20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Redmond
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Sigurd
Richfield
Glenwood
Annabella
Elsinore
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MITIGATION CAPABILITIES OF CERTAIN COUNTY AGENCIES

A. Sevier County Emergency Management

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Coordinate emergency planning and response activities with numerous county agencies. Planning encompasses preparedness, response, recovery, and mitigation.

    b. Update and exercise emergency operations and mitigation plans.

    c. Coordinate state sponsored training for county agencies including; law enforcement, public health, social services, fire departments, emergency medical services, etc.

    d. Coordinate the county's Local Emergency Planning Committee. (meets quarterly)

    e. Coordinate the county's Tier Two reporting. (hazardous materials)

    f. Public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.

    g. Work with schools and local businesses to help create site-specific hazard response plans and present in-service education to local business employees.

    h. Responsible for timely and effective public information releases during emergency situations.

    i. During a disaster declaration, emergency management has all county resources at their disposal including manpower, communications, and equipment.

    j. Have verbal mutual aid agreements with Juab, Millard, Piute, Sanpete, and Wayne County Emergency Management Agencies for necessary resources during a disaster situation.

    k. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.

l. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. In coordination with the Six County Association of Governments, assist with applications for federal and state funding such as the Hazard Mitigation Grant Program.

   b. Involved with inspecting hazardous material storage sites and fulfilling Tier Two reporting requirements.

   c. Participate in dam inspections with the State Division of Water Resources.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: Sevier County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include:

   Sevier County Commissioners, Sevier County Road Department, Sevier County Sheriff's Department, various other law enforcement, fire, communication, and emergency medical agencies.

   b. <u>Non-local Agencies</u>: Sevier County Emergency Management coordinates with numerous state and federal agencies. These agencies include the Utah Division of Emergency Services and Homeland Security, Utah Highway Patrol, State Health Department, Department of Transportation, and Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   a. Provide listings of eligible mitigation projects so counties can be prepared when funds become available.

   b. Warning systems and sirens are outdated and inadequate. At this time, funding is not available for improvements.

   c. Sevier County is constantly striving to improve planning and exercise activities and response capabilities. However, with the county growing and becoming more industrial, the threat of potential hazards increases, which increases the need for resources, training, and awareness.

d. County needs to add natural hazard mitigation to the General Plan and to the zoning and subdivision ordinances. Based on funding, Six County Planning Staff will work with the county to update the General Plan and the zoning ordinances to reflect natural hazard mitigation. Existing zoning requirements for flood plain management need to be enforced.

B. <u>Sevier County Highway Department *</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Design bridges, culverts, and overflow sections. The County Highway Department follows a very detailed list of design standards for all projects within the county.

   b. Continually working with the Utah Department of Transportation (UDOT) on various projects since the UDOT dispenses federal funding. While the UDOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:

   a. Responsible for and have authority to regulate and inspect all projects completed within the county.

   b. All projects funded by the state or federal government are designed by a consulting engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the consulting engineering company and is overseen by the county to ensure standards are met. Many county projects are designed with in-house expertise and engineers are consulted if problems arise.

   c. All funding in one-way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: The County Highway Department has little interaction with other county agencies concerning roads and bridges. They do, however, coordinate with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States Attorney's Office. The land values are usually developed by the Tax Equalization Office and approved by the County Commission.

b. Non-local Agencies: The County Highway Department coordinates with various State and Federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the Utah Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the Utah Historical Society.

4. General recommendations/Emergency Management concerns:

a. Sevier County Highway Department should assist local government with floodplain management and water development permitting.

C. Central Utah Public Health

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Central Utah Public Health (CUPH) will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.

b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.

c. Programs include; waste water treatment, water pollution, public health nursing, immunization programs, solid waste regulation, food establishment inspections, air quality, and vector control.

2. Responsibility and authority in the regulating, inspecting or funding of projects.

a. CUPH Health is a unit of state government that operates through agreements or Memorandums of Understanding with the Utah Department of Health to enforce state public health statutes within the Six County district. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with other government agencies:

    a. Local Agencies: Within the scope of public health, CUPH coordinates with the following local agencies; Sevier County Emergency Management, local law enforcement agencies (city and county), local school boards, and planning and zoning agencies.

    b. Non-local Agencies: Within the scope of public health, CUPH coordinates with the following agencies; Utah Department of Health and state and federal law enforcement agencies.

4. General recommendations/Emergency Management concerns:

    a. Public Health is normally under funded and understaffed at all levels of government. Should CUPH be called upon for expertise at a time of emergency or disaster, it normally does not have instrumentation for site level determinations of any kind without support from other agencies.

    b. Public health agencies should be included in equipment storage; e.g., FEMA equipment "stored" and used at public health agencies, rather than being stored at a warehouse. For example, radio equipment that belongs to FEMA is based at county emergency management offices; the same could be done with air sampling equipment or other instruments/kits etc., which could be used by public health agencies both for daily work and at a time of emergency or disaster.

D. Sevier County Sheriff's Department

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Responsible for law enforcement and criminal investigation in unincorporated areas of the county and in smaller towns that do not have police departments.

    b. Provide standard law enforcement manpower and equipment.

    c. In disaster situations, provide; warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

    d. Provide public awareness and educational programs. (911 education, safe kids program, etc.)

e. Have mutual aid agreements with all surrounding counties and the Utah State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Within the scope of law enforcement, the Sevier County Sheriff's Department coordinates with various local agencies. These agencies include Sevier County Emergency Management and various local police departments.

   b. Non-local Agencies: Sevier County Sheriff's Department coordinates with appropriate state and federal agencies including; Utah Highway Patrol, Utah Attorney Generals Office, Bureau of Criminal Identification, Utah Department of Transportation, and Federal Bureau of Investigation.

4. General recommendations/Emergency Management concerns:

   a. None

E. Koosharem, Monroe, Richfield, and Salina Fire Departments

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.

   b. Respond to accidents in order to provide rescue assistance.

   c. Assist Emergency Medical Services in providing emergency assistance to sick and injured. (first responders)

   d. Provide standard firefighting manpower and equipment.

   e. Respond to spills and releases of hazardous materials and assist in mitigating the detrimental human and environmental effects of these occurrences.

f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.

g. Provide training for department members that will enable them to effectively and efficiently carry out their respective duties and responsibilities.

h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.

i. Assist in enforcement of city fire ordinances.

j. Fire investigation.

k. Provide assistance to other jurisdictions, as department resources and commitments allow. The State Division of Forestry and Fire Control have a contract to fight wild land fires in Sevier County.

l. Inspections and preplanning within the county to reduce hazards and aid in fire prevention.

m. Assist with the county's tier two reporting. (Hazardous materials storage sites)

n. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies:</u> In efforts to decrease vulnerability to hazards, the city fire departments coordinate with various local agencies. These agencies include Sevier County Emergency Management, Richfield City Police Department, Salina City Police Department, Sevier County Sheriff's Department, local Public Works, and local Emergency Medical Services.

   b. <u>Non-local Agencies:</u> Utah State Fire Marshal and the Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

   Our district has seen an increase in the number and variety of calls. As first responders, we have to train and equip our fire departments for various situations that may arise, such as: vehicle extrication, various types of hazardous materials, and many other types of responses. Each added type of response increases the need for equipment and the time our volunteers need to spend in training

   a. Seek funding outside of the district for additional equipment that will improve the effectiveness of our responses as well as increase the margin of safety for our volunteers.

   b. Explore training options to cover the expanding variety of responses in our district.

   c. Look into recruitment and retention programs that will work in our district.

F. Utah State University Extension Service *

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. The Utah State University Extension Service provides practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.

   b. County Extension Agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.

   c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage clientele.

   d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.

   e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.

f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.

g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. Authority is at federal level.

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Sevier County Emergency Management and Central Utah Public Health.

   b. Non-local Agencies: Utah State University, Utah State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/Emergency Management concerns:

   a. None.

G. Richfield and Salina Police Departments

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Provide general law enforcement services that are designed to efficiently prevent crime and promote concepts of community policing. These services include traffic control, 911 communications, criminal and accident investigations, neighborhood policing, animal control, and neighborhood and business watches.

   b. Provide standard law enforcement manpower and equipment.

   c. Provide public awareness and training programs including: Drug Abuse Resistance Education (DARE), juvenile diversion programs, Crime Stoppers, gang awareness, Citizen Police Academy, Jr. Police Academy, and a ride along program.

d. In disaster situations, provide: warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

e. Involved in the county's Local Emergency Planning Committee (LEPC) and tier two reporting (Hazardous Materials).

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

a. Provide input to and enforce city ordinances regarding public safety.

3. Leadership and coordination with other government agencies:

a. <u>Local Agencies:</u> Within the scope of law enforcement, the Richfield and Salina Police Departments coordinate with various local agencies. These agencies include: Sevier County Emergency Management, Sevier County Sheriff's Department, and the city fire departments.

b. <u>Non-local Agencies:</u> Richfield and Salina Police Departments coordinate with appropriate state and federal agencies including: Utah Highway Patrol, Federal Bureau of Investigation (FBI), Bureau of Alcohol, Tobacco, and Firearms (ATF), and Federal Emergency Management Agency (FEMA).

4. General recommendations/Emergency Management concerns:

a. Explore funding alternatives to upgrade outdated and inadequate warning systems (sirens). At this time, federal funding is not available.

b. Intensify awareness and training in regard to civil disorder and terrorism incidents.

OTHER AGENCY RESOURCES

A. Mitigation and risk reduction:

1. <u>Sevier County Social Services:</u> Temporary assistance to needy families, food stamps, medically needy programs, adult services, homeless assistance, family planning, etc.

2. <u>Army Corps of Engineers:</u> Water and dam management within the county. Provide technical expertise, sandbags, and heavy equipment.

3. Utah Highway Patrol: Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

4. State Fire Marshal: Hazmat route utilization; HAZMAT technical assistance; situation and damage assessment.

5. Forestry, Fire & State Lands: Debris removal from recreational facilities; technical assistance; situation and damage assessment.

6. Utah Division of Wildlife Resources: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

7. State Radio Communications: Exercise readiness of warning systems and communication support.

8. Department of Agriculture: Assists with situation and damage assessment; coordination with USDA; HAZMAT technical assistance; state land use program.

9. Department of Workforce Services: Situation assessment and administration of disaster unemployment assistance programs.

10. Human Services: Insure liaison with private relief agencies for disaster victims.

11. State Historical Society: Project screening and situation assessment.

Annex 7 -- Wayne County

In order to effectively identify and mitigate natural hazards in Wayne County, a Pre-Disaster Mitigation Planning Team representing Emergency Management and each jurisdiction in the county was created. Table 1 names the members of this team. Input from the team was used in organizing hazard mitigation strategies outlined in *Annex 8* and *Appendix U* of this plan.

Table 1: Wayne County Pre-Disaster Mitigation Planning Team

Name	Representing:
Vicky Bower, Emer. Mgr.	Wayne County
Clenn Okerlund, Commissioner	Wayne County
Allen Jones, Commissioner	Wayne County
Scott Durfey, Commissioner	Wayne County
Sherwood Albrecht, Mayor	Bicknell
Stan Alvey, Mayor	Hanksville
Ellis Brown, Mayor	Loa
Vanor Okerlund, Mayor	Lyman
Fred Hansen, Mayor	Torrey
Terry Heath	FFSL
Emery Polelonema	SCAOG
Edwin Benson	SCAOG

Past Hazard Events in Wayne County

Understanding the past is often the key to discovering what the future hold, this is especially true when planning for natural disasters. The fact that cities within Wayne County have experienced, for example, flooding in the past means flooding can occur in the future. While over time some of this has been mitigated for the low frequency of occurrence often results in hazards with little or no mitigation. Table 2 provides a brief history of Wayne County natural disasters. This table includes only sizable events found during our research, and may not represent the total history.

Table 2: Wayne County Natural Hazard History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood	August 4, 1957	Caineville	Destroyed bridge west of town blocked Highway 24	Source: Fremont River
Flood	August 25, 1961	Torrey	Highway 24 damaged	Source: South Desert Wash

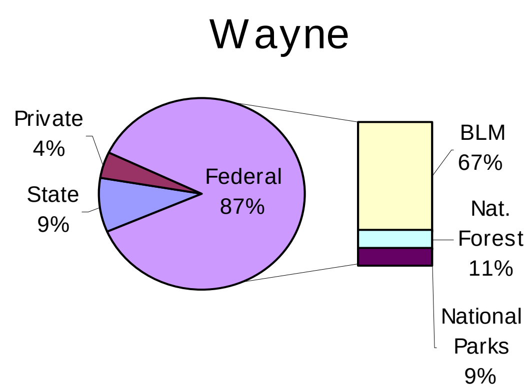
Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood	July 31, 1965	Bicknell/Lyman/ Teasdale/ Loa	Damage to homes, crops, ranches, and Highway 24 and 117	Heavy rains flooded area creeks.
Flood	August 18, 1965	Bicknell	Farmland, crops, orchards, and Highway 68 all damaged	10,000 acres of farmland destroyed.
Severe Weather	August 29, 1957	Hanksville	Crop damage	Hail
Severe Weather	May 31, 1969	Hanksville area	No Damage	Tornado; Three separate tornados touched down in uninhabited area.
Severe Weather	July 24, 1981	Hanksville	No Damage	Tornado (see Picture 1)
Severe Weather	August 31, 1986	Canyonlands NP	No Damage	Tornado
Severe Weather	April 4, 1993	Caineville	Damage to an RV, boat, and restaurant	Tornado, Estimated damage $8,000.
Severe Weather	August 11, 1993	Bicknell	1 death	Lightning Standing under a tree
Severe Weather	September 12, 2002	Hanksville	No Damage	Tornado (see Picture 2)


Picture 1 – Hanksville, July 24, 1981.

Picture 2 – Hanksville, September 12, 2002.

Development Trends
Approximately 65,051 acres or 4% of the total land area in Wayne County is privately held and outside the incorporated areas is mostly vacant. The other 96% is owned by the state or federal governments and aside from extractive industry is beyond the reach of development. Since land ownership determines how and where development proceeds, Figure 1 helps explain Wayne County's development trends.

Figure 1



The vast majority of landslides, debris flows and wildfires occur on these public lands with virtually no impact on development. Of the privately held land, most is not developable due to a lack of water and county zoning requirements of water access and a minimum of 5 acres per house. Other limitations to development include steepness of the terrain, flash flood plains and accessibility. There is still plenty of infill within town limits that can be utilized for safe development without developing in unincorporated, sparsely populated, or hazardous areas. Wayne County requires UBC on all new or proposed buildings. New subdivisions require a grading and drainage plan to mitigate any flooding, which may occur. Since most of the privately held land is along the relatively safe and accessible State Route (SR) 24 from Loa to Torrey and east of Capitol Reef National Park in Hanksville, development is occurring in this general area.

Historically and today, agriculture plays a huge part in the economy of Wayne County. Tourism has grown significantly since the establishment of Capitol Reef National Park in 1971. Transportation development had its beginnings in the original wagon trails, which brought the pioneers to this area. Later roads and SR 24 followed this east-west corridor. This corridor is where future development is likely to happen because of the private lands along this major transportation artery. Except for lands adjacent to the Fremont and Dirty Devil Rivers and their tributaries, this corridor is relatively safe from natural hazards.

1. Earthquake

Table 3: FEMA Hazard Profile for Earthquake in Wayne County

Frequency	Possible
Severity	Catastrophic
Location	Ground shaking will be felt throughout the western half of the county if a large earthquake were to occur. Surface fault rupture could be expected in areas of known historic fault movements. Liquefaction is expected in areas of high to moderate liquefaction potential, which covers a vast portion of Rabbit Valley, where most of the population resides.
Seasonal Pattern	None
Duration	Actual ground shaking will be under one minute yet after shocks may occur for weeks after.
Speed of Onset	No warning

Description of Location and Extent

Wayne County has a very limited seismic risk mostly contained to the western half of the county. Table 4 outlines fault line movement in Wayne County during the Quaternary Period or the last 1.6 million years (see Maps 1.1 and 1.2 starting on p.18 of this Annex).

Table 4: Fault Line Movement

NAME	MOVEMENT	SLIPRATE	STRUCTURE
Aquarius and Awapa Plateaus faults	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Thousand Lake fault	Mid to Late Quaternary (<750,000 years)	< 0.2 mm/yr	Simple
Thousand Lake fault	Quaternary (<1,600,000 years)	< 0.2 mm/yr	Simple
Needles fault zone	Latest Quaternary (<15,000 years)	< 0.2 mm/yr	Suspected

HAZUS MH Vulnerability Assessment

HAZUS-MH was used to determine vulnerability to earthquakes in the Six County planning area. Tables 5-9 are a summary of results from the HAZUS MH model. Damage and loss estimates are based on a 2500-year event with a magnitude 7.0 running the soils portion of the model. The complete Wayne County HAZUS MH run is available in *Appendix O*.

Number of people

Whether an earthquake occurs at night, during the day, or during a commute plays a significant role in estimating the number of casualties as outlined in Table 5.

Table 5: Casualties

Casualties	Nighttime –Minor	8
	Nighttime –Major	0
	Nighttime -Fatalities	0
	Daytime –Minor	6
	Daytime –Major	0
	Daytime- Fatalities	0
	Commute –Minor	7
	Commute –Major	0
	Commute-Fatalities	0

Buildings/Structures

Building Damage by Count -- Building damage is classified by HAZUS in five damage states: none, slight, moderate, extensive and complete. Table 6 lists the number of buildings by occupancy, which is estimated to have moderate to complete levels of damage.

Table 6: Building Damage by Count with Moderate to Complete Damage

Category	Number of Structures	Total Cost in millions of dollars **
Residential	93	12.0
Commercial	3	1.67
Industrial	0	0.15
Totals	347 *	14.57**

*****Includes all building categories with moderate to complete damage
** Structural, non-structural, content, inventory

Infrastructure Types and Amounts
Table 7 shows which critical facilities will receive damage and how much damage will result.

Table 7: Critical facilities

Classification	**Total**	**Least Moderate Damage >50%**	**Complete Damage > 50%**	**Functionality > 50% at day 1**
Hospitals	0	0	0	0
Schools	1	0	0	1
EOCs	0	0	0	0
Police Stations	1	0	0	1
Fire Stations	0	0	0	0

Debris Removal –Table 8 shows how much debris would be generated by the earthquake and how many loads it would take to remove the debris, based on 25 tons per load. One truck can likely haul one load per hour. A second debris removal issue is landfill space.

Fifty thousand tons (50,000) at a weight to volume ratio of one ton per cubic yard would cover more than ten acres to a depth of three feet.

Table 8: Debris Generated (thousands of tons)/Loads to Remove Debris

Debris Generated	10
Loads (25 tons per load)	400

Fire Following --The Great San Francisco Earthquake of 1906 illustrated the hazard a city could face from fire following an earthquake. Multiple ignitions and broken water mains conspired to make firefighting nearly impossible. HAZUS uses the estimated building damages, loss of transportation infrastructure and estimated winds to calculate the estimated area that would be burned following an earthquake. Table 9 provides estimates of ignitions, people at risk and the building stock exposed to fires following an earthquake.

Table 9: Fire Following Event, Population Exposed, and Building Stock Exposed

Ignitions	3
People Displaced	29
Value Exposed (mill. $)	2

2. Floods

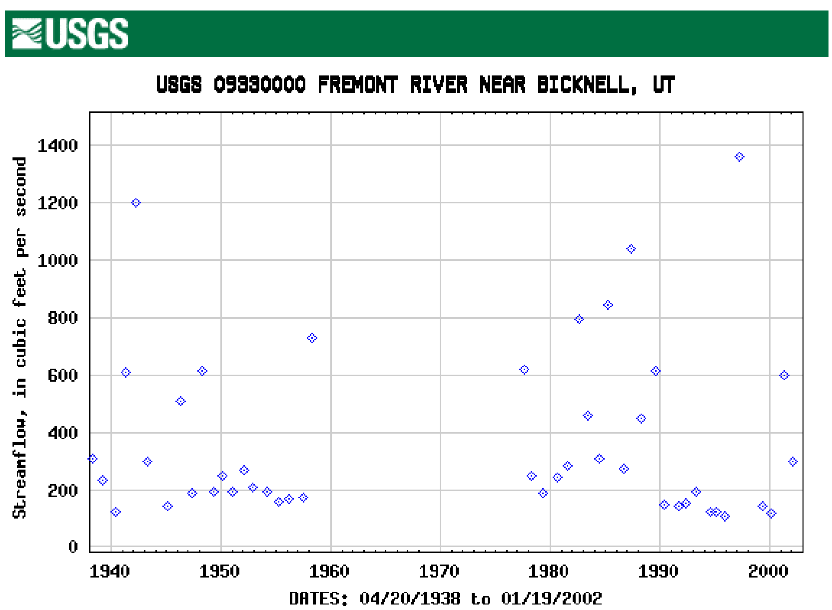
Table 10: FEMA Hazard Profile

Frequency	Likely
Severity	Limited
Location	Flooding would occur in and along flood plains.
Seasonal Pattern	Wayne County's main flooding threat is from snowmelt runoff during spring months.
Duration	The type of event determines the duration of flooding; flooding due to summer thunderstorms can last a couple of hours where as flooding due to spring runoff can last weeks.
Speed of Onset	Six to twelve hours.

Description of Location and Extent

Based on the flooding which occurred during the spring of 1983 and 1984 both as a result of rapid snow melt events, experience would suggest these events would appear to be a greater hazard than cloudburst storms. Yet serious hazards could result from either storm. Flooding is primarily from the Fremont and its tributaries Deep Creek, Pleasant Creek, Sandy Creek, and Sweetwater Creek. The Fremont River has caused damage to state route 24 in the past. Since 1936 the stream gauge near Bicknell has recorded discharges as high as 1360. See Chart 1.

Chart 1: Fremont River Discharges near Bicknell



Several dry washes around Hanksville have in the past flooded, resulting in property damage in Hanksville.

Description of type
Precipitation in Wayne County originates from two major sources. Moisture laden polar pacific air entering the area from the west or northwest during the winter produces large general storms, which most often result in heavy snowfall in the upper elevations and either snowfall or moderate intensity rainfall in the lower elevations.

The second major source of precipitation in the area arises from tropical air masses entering from the south and southwest out of the Gulf of Mexico during the summer months. Often wrongly referred to as monsoons these air masses cause high intensity convective cloudburst storms, which are augmented by the orthographic lifting which occurs as the air mass passes over neighboring mountains. Precipitation from these two types of storms can produce flash floods, snowmelt floods, post wildfire/damaged watershed floods, and severe winter weather.

Note on Vulnerability Assessment
At this time, data was insufficient to conduct a risk analysis for flood events in Wayne County. Flood Insurance Studies were study were applicable to aid in determining risk. However, the current mapping projects being led by the county and state will result in better data that will assist in understanding risk. As part of its efforts to mitigate hazards and protect lives and property from the devastating effects of natural disasters, FEMA aims to provide individuals, businesses, and communities with information and tools to work proactively to mitigate hazards and prevent losses resulting from disasters. One of these tools is the new HAZUS MH flood model. Unfortunately at the current time this model does not work well enough to complete loss numbers for each jurisdiction in the county.

The U.S. Army Corps of Engineers wrote a Flood Hazard Identification Study (see *Appendix N)* which is included in the flood mitigation goals found in *Annex 8* and *Appendix U* of this plan. This study looks predominately at jurisdictions which are unmapped or mapped as D zones by the National Flood Insurance Program.

3. Landslides

Table 11: FEMA Hazard Profile for Landslides in Wayne County

Frequency	Likely
Severity	Negligible
Location	Mass wasting in Wayne County is located predominately along the Canyons surrounding Rabbit Valley (see Map 3.1 on p.20 of this Annex).
Seasonal Pattern	Landslides most often occur within Wayne County during spring months with higher than normal amounts of precipitation.
Duration	Several months
Speed of Onset	No warning

Description of Location and Extent
The areas at greatest risk to landslides are mostly along the canyons surrounding Rabbit Valley, especially the northeast portions of Lyman and east of Bicknell. Tables 12 and 13 show the number of acres and households at risk from landslides. The extent and cost of damage to roads and electric infrastructure are shown in Tables 14 and 15, respectively.

Table 12: Landslide Acres

County Name	Acres of Active landslides	Historically Active Landslides 1847 to Present
Wayne	217	158,416

Table 13: Structure Loss and Value as a Percentage of Total Acreage

City Name	Acres of Historically Active Landslides 1847 to Present	Households Vulnerable to Landslide/Cost*
Lyman	227	17/1,275,000

*Includes value of land.

Table 14: Roads

Name	**Miles**	**Estimated Cost**
Local Neighborhood/local/city street	106	255,831,000
State Route 12	5	12,067,500
State Route 24	33.8 Feet	15,446
State Route 72	1.4	3,378,900

Table 14 data represents total length of roads, which overlay historically active landslides.

Railroads

This vulnerability analysis using best available data found no railroad track at risk in Wayne County.

Table 15: Electric Infrastructure

Name	Description	Estimated Cost
Power Generation Station	Loa	10,000,000
Power Generation Station	Unknown owner	10,000,000

4. Wildfire Risk

Table 16: FEMA Hazard Profile

Frequency	Likely
Severity	Negligible (10-25% of jurisdiction affected)
Location	Typically occur at the valley's boundary with the foothills.
Seasonal Pattern	Most wildfires affecting Wayne County occur during mid to late summer months (fire season).
Duration	The amount of time needed to contain a wildfire depends on a variety of uncontrollable variables such as: wind speed, relative humidity, type, and moisture content of fuel, weather, and topography. Thus containment time varies for each fire.
Speed of Onset	6 to 12 hours is the minimum amount of time given to homeowners in order to evacuate.

Description of Location and Extent
The Division of Emergency Services and Homeland Security augmented a statewide wildfire database to represent wildfire vulnerability into five categories: Extreme, High, Medium, Low, and Very Low. These ratings cover all of Wayne County and are based on the type and density of vegetation in each area. Additional factors influencing wildland fires such as weather conditions, wind speed and direction are not considered in this risk assessment.

Analysis of GIS data of Wayne County yielded a minimal county wildfire risk. Present wildfire risk is moderate to very low, with no areas classified as high or extreme. This is not to say there is not risk. The majority of county is covered by desert brush will moderate burn cycles.

See Map 4.1 on p. 21 of this Annex for a visual display of location and severity of wildfire risk in Wayne County. Tables 17-20 show the number of acres and households at different levels of wildfire risk in Wayne County.

Table 17: Wildfire Risk Acres

County Name	Acres of Extreme	Acres of High	Acres of Moderate	Acres of Low/Very Low
Wayne	None	None	125,150	1,450,008

Table 18: Unincorporated County

County	Households in Extreme/Cost	Households in High/Cost	Households in Moderate/Cost
Wayne	None/0	None/0	105/6,300,000

Table 19: Incorporated Wayne County*

City Name	Acres of High	Acres of Moderate
Bicknell	None	None
Hanksville	None	None
Loa	None	None
Lyman	None	38
Torrey	None	22

*No Extreme wildfire risk within Wayne County

Table 20: Structures in Wildfire Area

City Name	Households in Extreme/Cost*	Households in High/Cost*	Households in Moderate/Cost*
Bicknell	None/0	None/0	None/0
Hanksville	None/0	None/0	None/0
Loa	None/0	None/0	None/0
Lyman	None/0	None/0	3/180,000
Torrey	None/0	None/0	10/600,000

*Excludes content value, which would result in, and increase of 50% to the values listed.

Tables 21-23 show extent and cost of wildfire risk to roads, railroads, and electric infrastructure in Wayne County.

Table 21: Roads

Name	Miles	Estimated Cost
Local Neighborhood/local/city street	340.4	821,555,400
State Route 12	12.4	29,927,400
State Route 24	13.7	33,064,950
State Route 72	1.2	2,896,200

Table 21 data includes road lengths within areas determined to have an extreme, high, or moderate risk to wildfire as determined by the Utah Statewide Fire Risk Assessment.

Table 22: Railroads

Railroad	Miles	Estimated Cost
Railroad	n/a	n/a

No rail loss

Table 23: Electric Substations

Name	Description	Estimated Cost
Power Generation Station	South of Torrey	10,000,000

5. Problem Soils

Table 24: Hazard Profile for Problem Soils in Wayne County

Frequency	Likely
Severity	Negligible (10-25% of jurisdiction affected)
Location	Lightly populated central and eastern Wayne County.
Seasonal Pattern	None
Duration	Problems associated with soils last for long periods of time.
Speed of Onset	More than 24 hour warning time.

Description of Location and Extent
The greatest hazard from problem soils is Expansive Soils around Torrey (see Map 5.1 on p.22 of this Annex).

6. Dam Failure

Table 25: Hazard Profile for Dam Failure

Frequency	Possible
Severity	Limited
Location	Would occur downhill from existing dams.
Seasonal Pattern	None
Duration	Depends on dam and type of break; Could be a wall of water which passes through in a few hours, or a slower break which could last for weeks.
Speed of Onset	6 to 12 hours.

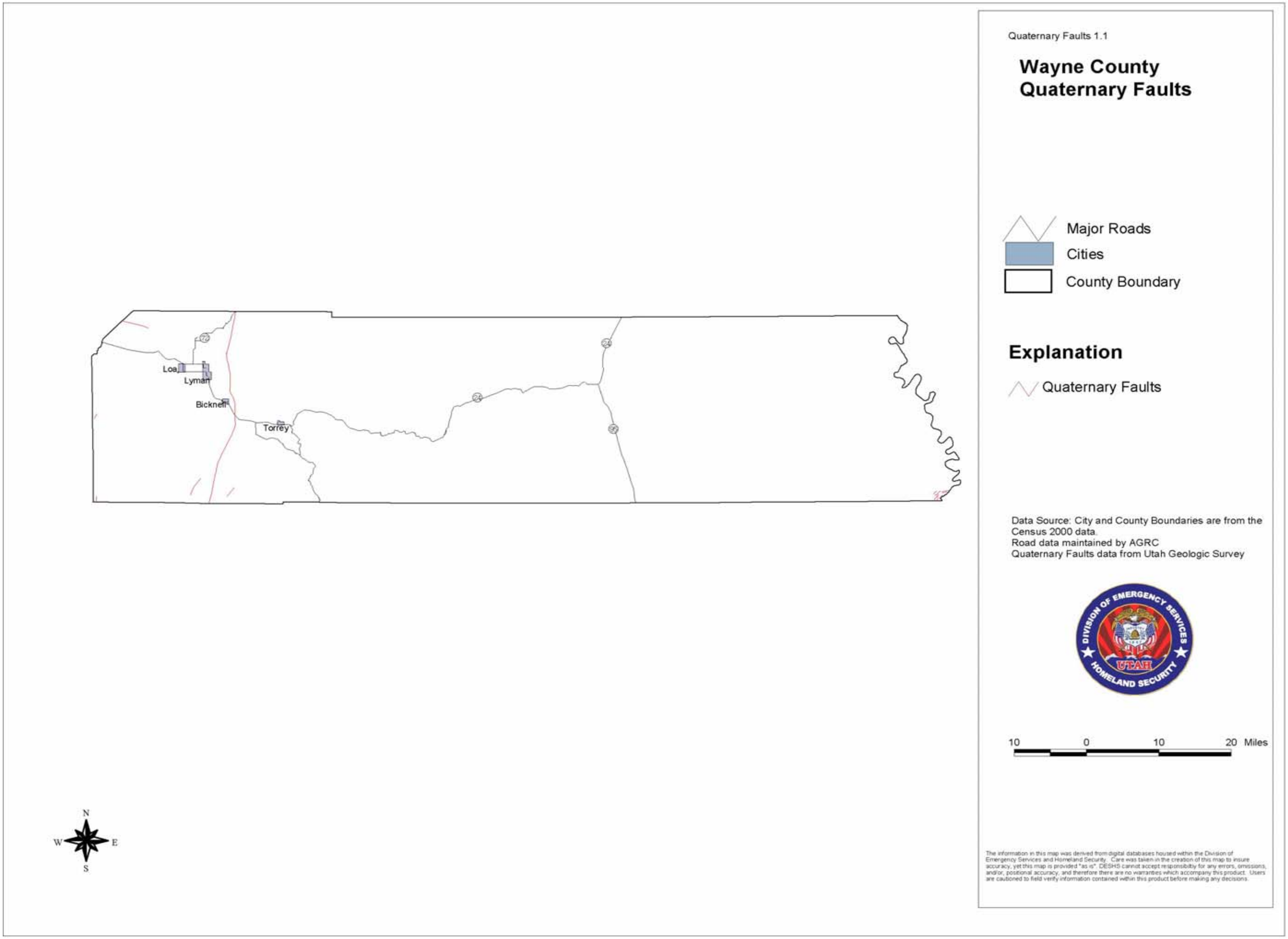
Description of Location and Extent
There are three high hazard dams, which would impact Wayne County, if failure were to occur. Two of these dams, Johnson Dam and Forsythe Dam, are physically located in Sevier County adjacent to the Wayne County line and upstream on the Fremont River from the third dam Mill Meadow, which is located in Wayne County. The possibility exists for failure of one dam resulting in failure of downstream dams. Wayne County is very large in area and very small in populations, however the majority of the population does live below and within about thirty miles of the above-mentioned dams and within a few miles of the Fremont River and its flood plain. See Map 6.1 on p.23 of this Annex.
The only high hazard dam physically located in Wayne County (see Table 26):

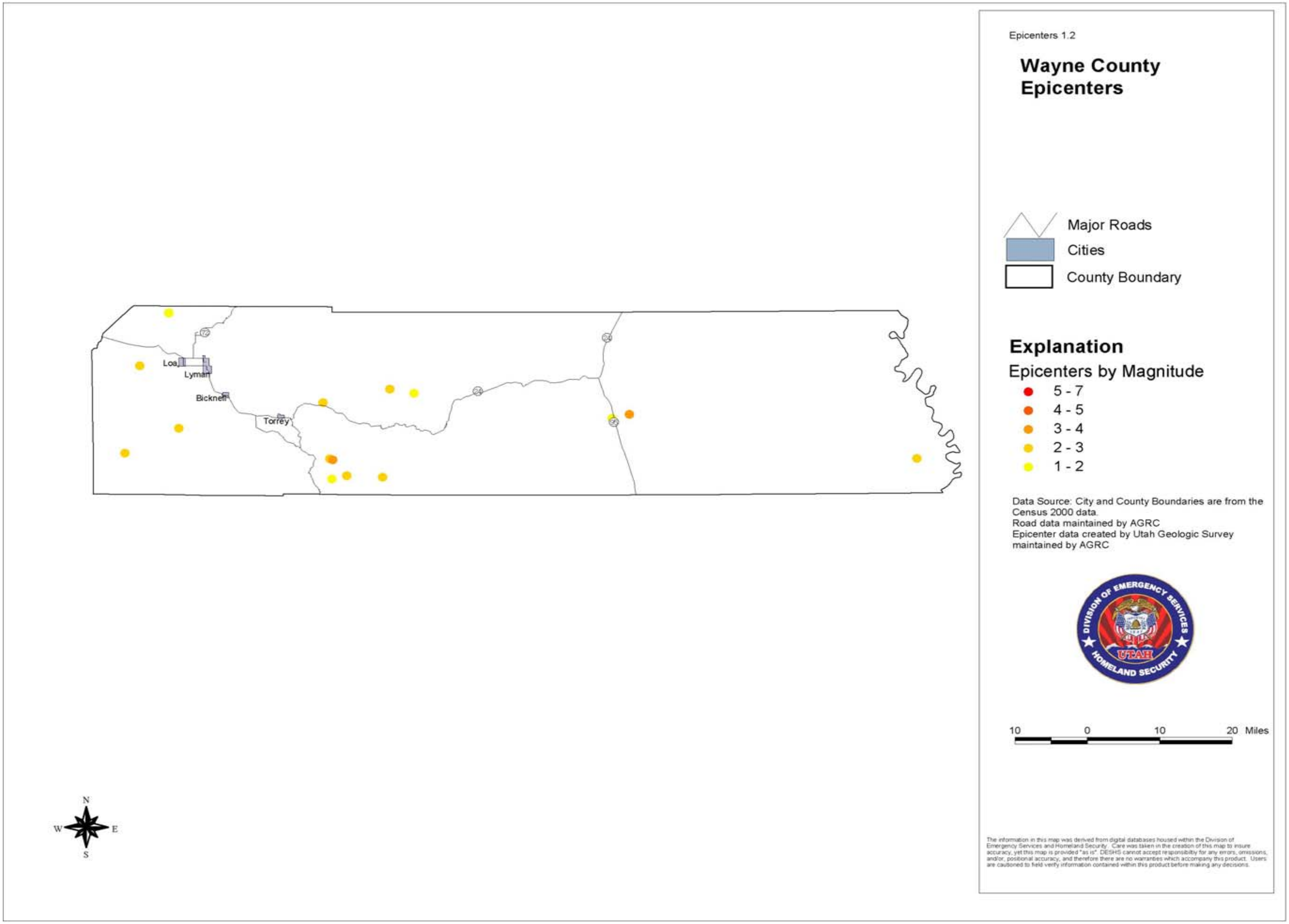
- Mill Meadow

Table 26: High Risk Dam

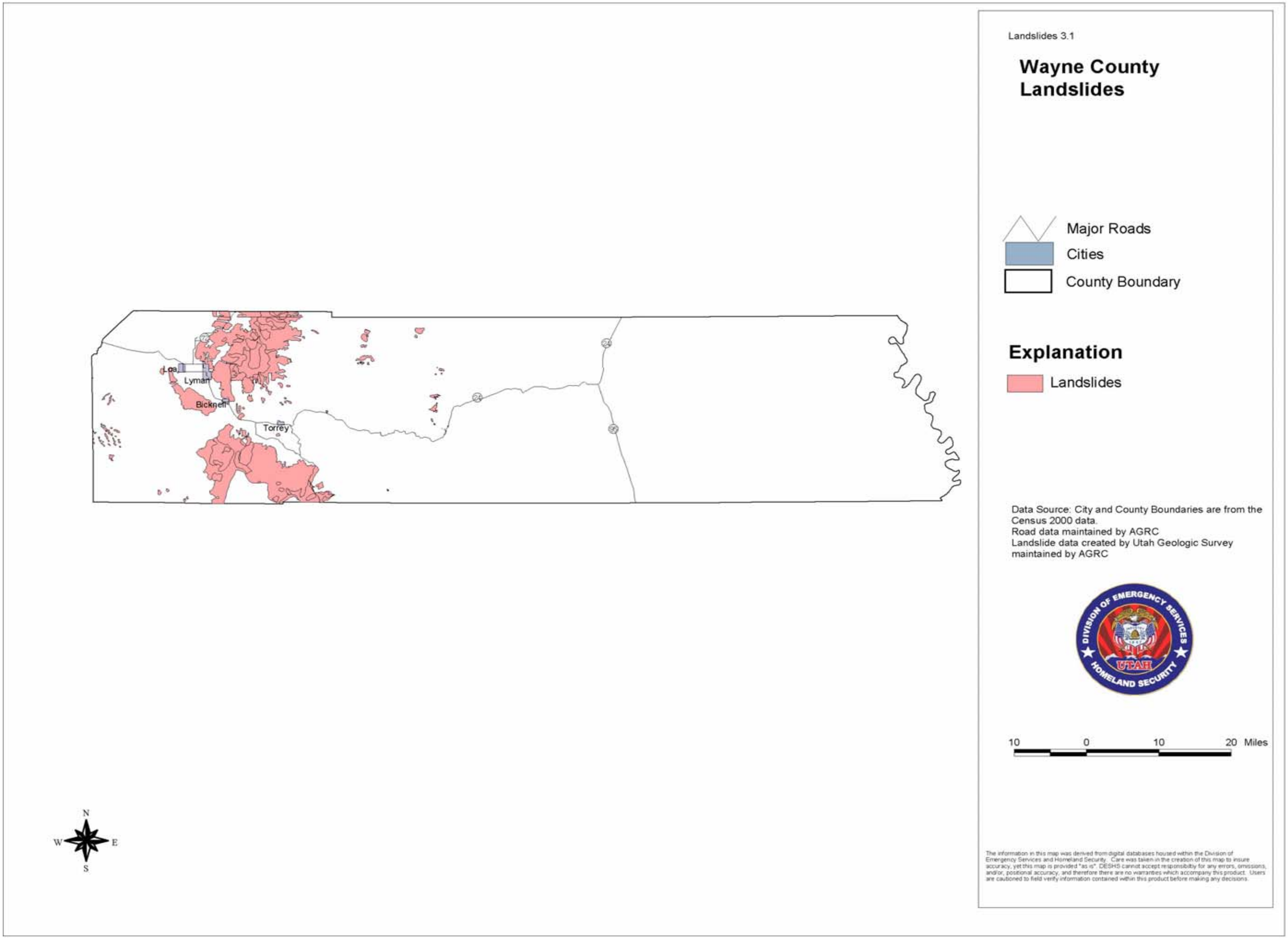
Name	Year Completed	Type	Storage Acre Feet	Breach Flow cfs
Mill Meadow	1954	Earth Fill	5232	116000

Note on the Wayne County Maps
The Town of Hanksville was incorporated in 1997, but somehow missed by the U.S. Census of 2000. Since the following maps are based on official census data, Hanksville Town was inadvertently excluded. Hanksville Town is located at the intersection of Utah Highways 24 and 95 in eastern Wayne County. During the vulnerability analysis Hanksville is considered as part of the county total.


Quaternary Faults 1.1
Wayne County
Quaternary Faults
Major Roads
Cities
County Boundary
Explanation
Quaternary Faults
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Quaternary Faults data from Utah Geologic Survey
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10
0
10
20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibilty for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Loa
Lyman
Bicknell
Torrey
N
W
E
S



Epicenters 1.2
Wayne County Epicenters
Loa
Lyman
Bicknell
Torrey
Major Roads
Cities
County Boundary
Explanation
Epicenters by Magnitude
5 - 7
4 - 5
3 - 4
2 - 3
1 - 2
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Epicenter data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10 0 10 20 Miles
N
W
E
S


Landslides 3.1
Wayne County Landslides
Loa
Lyman
Bicknell
Torrey
Major Roads
Cities
County Boundary
Explanation
Landslides
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Landslide data created by Utah Geologic Survey maintained by AGRC
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10
0
10
20 Miles
N
W
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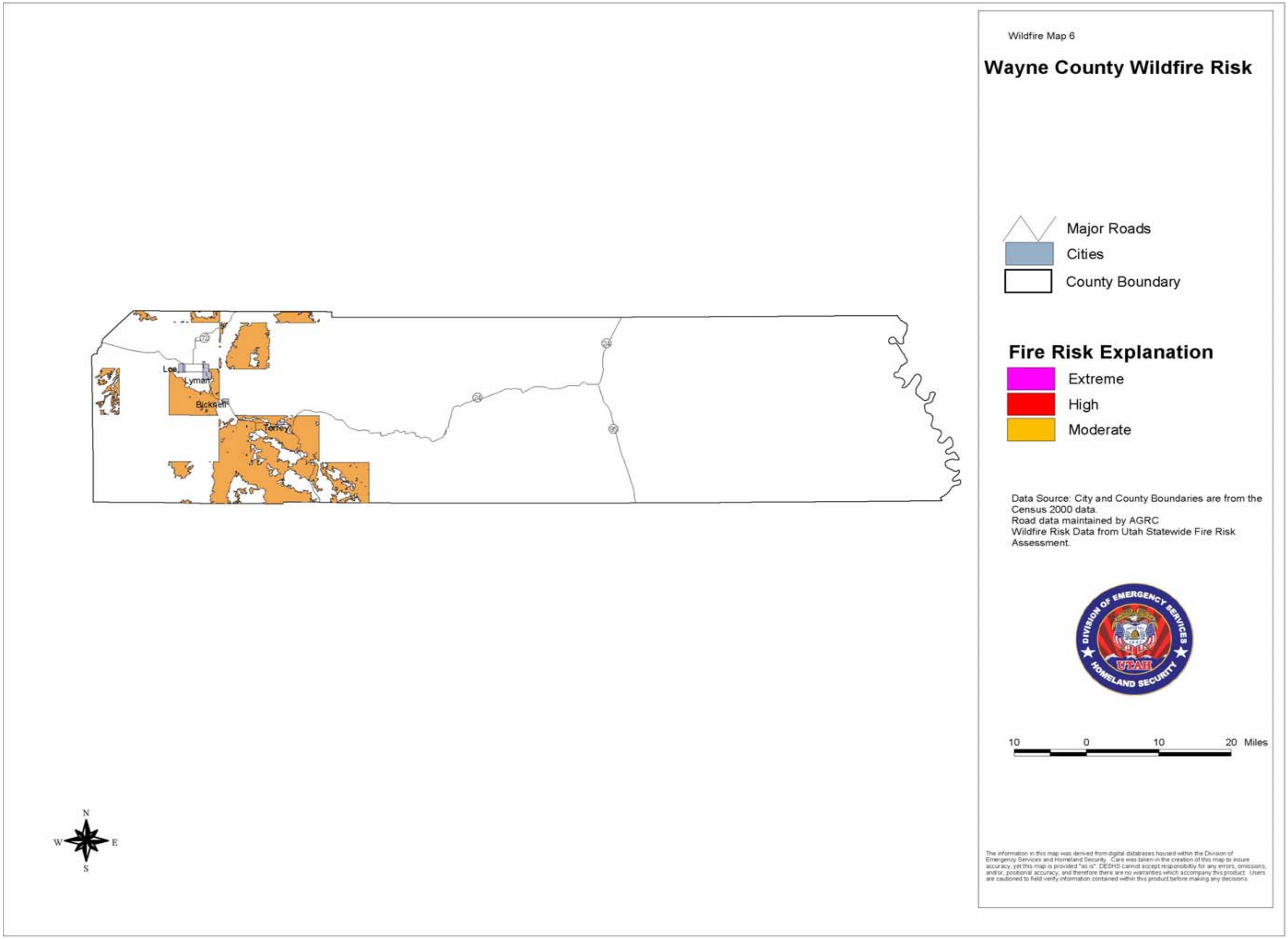
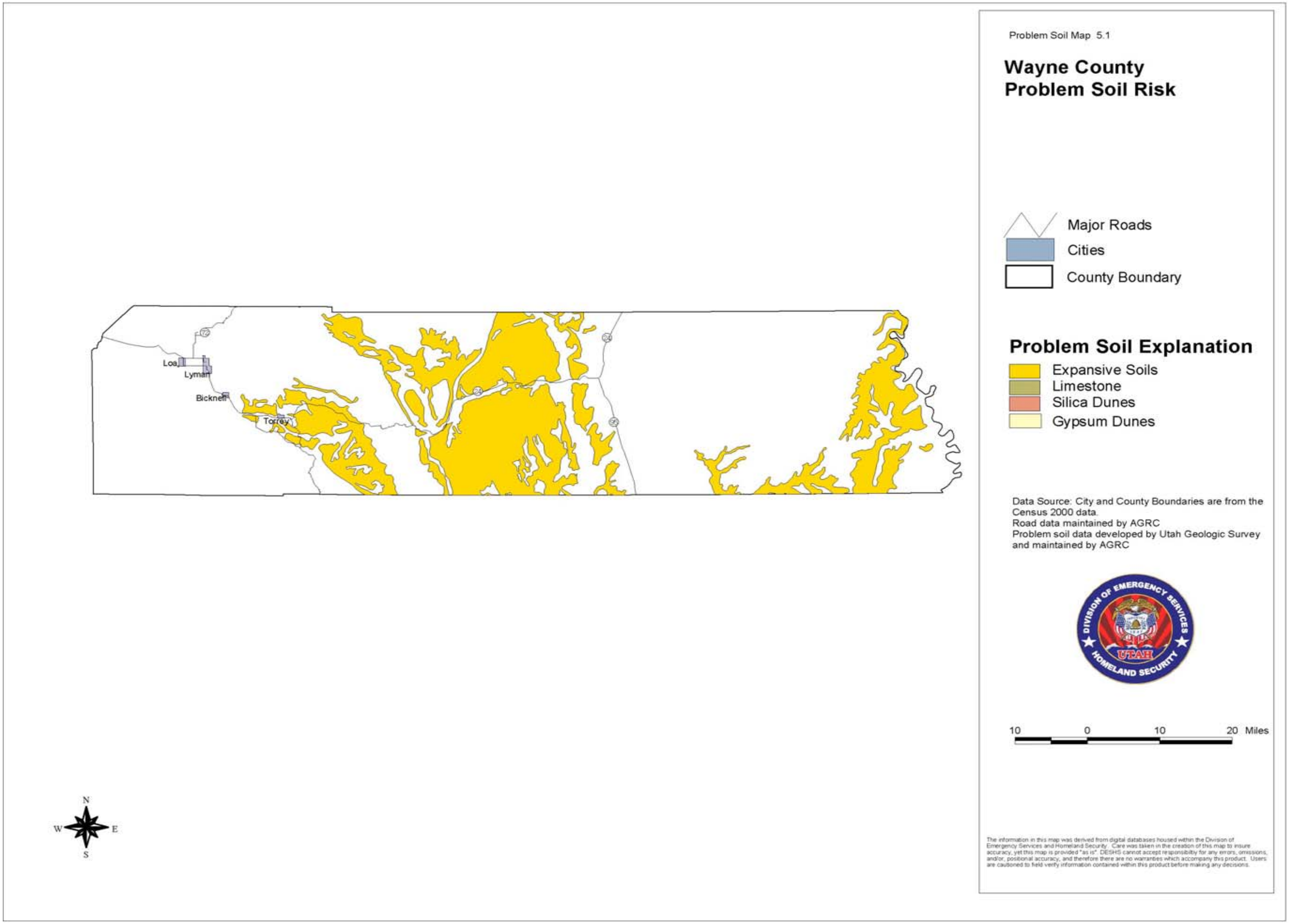
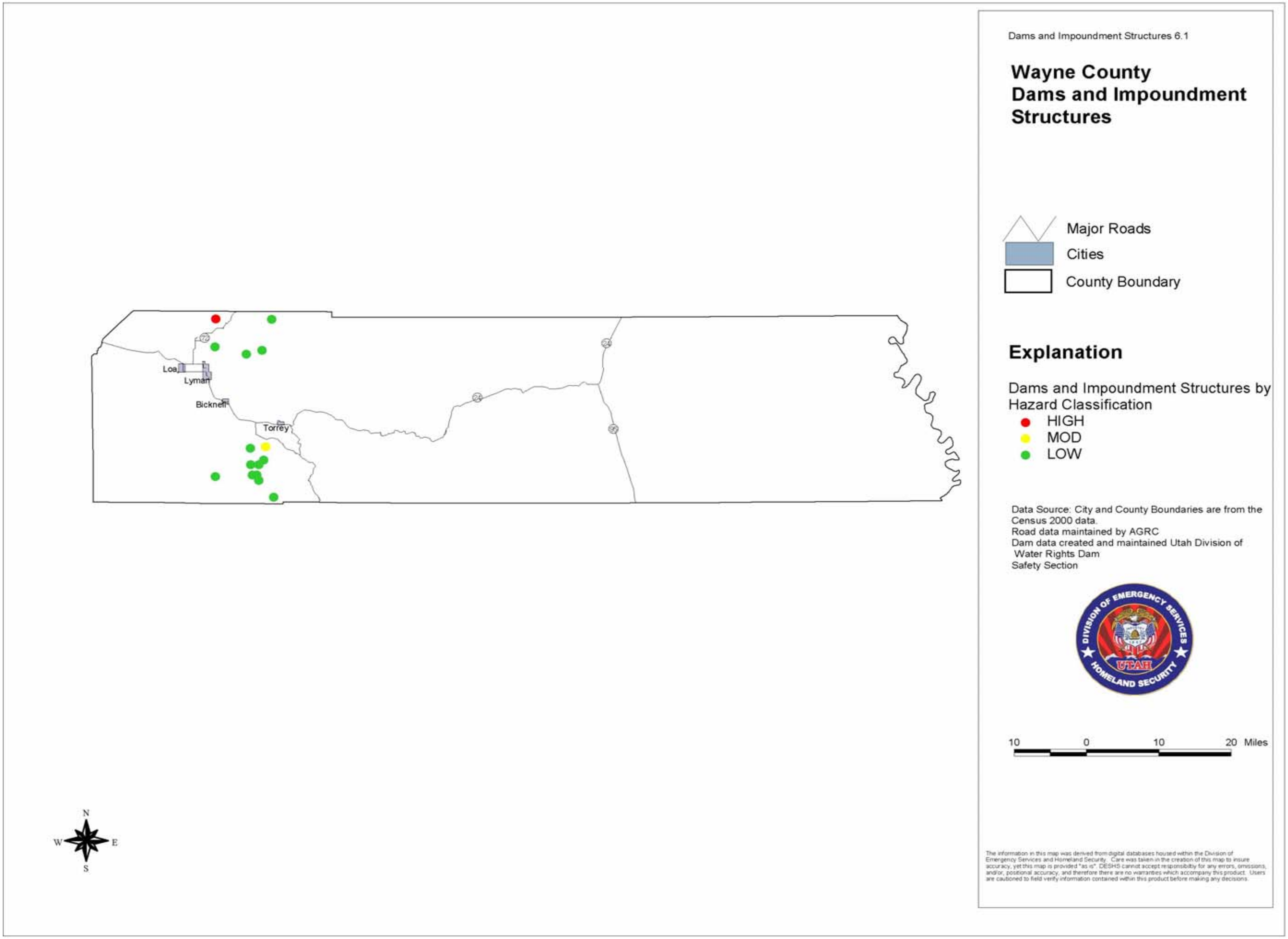
S
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.


Wildfire Map 6
Wayne County Wildfire Risk
Loa
Lyman
Bicknell
Torrey
Major Roads
Cities
County Boundary
Fire Risk Explanation
Extreme
High
Moderate
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Wildfire Risk Data from Utah Statewide Fire Risk Assessment.
DIVISION OF EMERGENCY SERVICES
UTAH
HOMELAND SECURITY
10
0
10
20 Miles
N
W
E
S
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.


Problem Soil Map 5.1
Wayne County
Problem Soil Risk
Major Roads
Cities
County Boundary
Problem Soil Explanation
Expansive Soils
Limestone
Silica Dunes
Gypsum Dunes
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Problem soil data developed by Utah Geologic Survey and maintained by AGRC
10
0
10
20 Miles
The information in this map was derived from digital databases housed within the Division of Emergency Services and Homeland Security. Care was taken in the creation of this map to insure accuracy, yet this map is provided "as is". DESHS cannot accept responsibility for any errors, omissions, and/or, positional accuracy, and therefore there are no warranties which accompany this product. Users are cautioned to field verify information contained within this product before making any decisions.
Loa
Lyman
Bicknell
Torrey
N
W
E
S


Dams and Impoundment Structures 6.1
Wayne County
Dams and Impoundment
Structures
Major Roads
Cities
County Boundary
Explanation
Dams and Impoundment Structures by Hazard Classification
HIGH
MOD
LOW
Data Source: City and County Boundaries are from the Census 2000 data.
Road data maintained by AGRC
Dam data created and maintained Utah Division of Water Rights Dam Safety Section
10 0 10 20 Miles
Loa
Lyman
Bicknell
Torrey
N
W
E
S

MITIGATION CAPABILITIES OF CERTAIN COUNTY AGENCIES

A. Wayne County Emergency Management

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

    a. Coordinate emergency planning and response activities with numerous county agencies. Planning encompasses preparedness, response, recovery, and mitigation.

    b. Responsible for everyday operations of the county’s Emergency Operations Center.

    c. Update and exercise emergency operations and mitigation plans.

    d. Coordinate state sponsored training for county agencies including; law enforcement, public health, social services, fire departments, emergency medical services, etc.

    e. Coordinate the county’s Local Emergency Planning Committee. (meets quarterly)

    f. Coordinate the county’s Tier Two reporting. (hazardous materials)

    g. Public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.

    h. Work with schools and local businesses to help create site-specific hazard response plans and present in-service education to local business employees.

    i. Responsible for timely and effective public information releases during emergency situations.

    j. During a disaster declaration, emergency management has all county resources at their disposal including manpower, communications, and equipment.

    k. Have verbal mutual aid agreements with Millard, Piute, Sanpete, Sevier, and Wayne County Emergency Management Agencies for necessary resources during a disaster situation.

l. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.

m. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

    a. In coordination with the Six County Association of Governments, assist with applications for federal and state funding such as the Hazard Mitigation Grant Program.

    b. Involved with inspecting hazardous material storage sites and fulfilling Tier Two reporting requirements.

    c. Participate in dam inspections with the Army Corp of Engineers.

3. Leadership and coordination with other government agencies:

    a. <u>Local Agencies</u>: Wayne County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include:

    Wayne County Commissioners, Wayne County Road Department, Wayne County Sheriff Department, various other law enforcement, fire, communication, and emergency medical agencies.

    b. <u>Non-local Agencies</u>: Wayne County Emergency Management coordinates with numerous state and federal agencies. These agencies include the Utah Division of Emergency Services and Homeland Security, Utah Highway Patrol, State Health Department, Department of Transportation, and Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:

    a. Provide listings of eligible mitigation projects so counties can be prepared when funds become available.

    b. Warning systems and sirens are outdated and inadequate. At this time, funding is not available for improvements.

c. County needs to add natural hazard mitigation to the General Plan and to the zoning and subdivision ordinances. Existing zoning requirements for flood plain management need to be enforced.

d. The existing addressing system is outdated and confusing for emergency responders and needs to be unified, revised and clarified, including the installation of appropriate signage. Outside as well as local funding should be sought for implementation of this project.

B. <u>Wayne County Highway Department *</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

   a. Design bridges, culverts, and overflow sections. The County Highway Department follows a very detailed list of design standards for all projects within the county.

   b. Continually working with the Utah Department of Transportation (UDOT) on various projects since the UDOT dispenses federal funding. While the UDOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:

   a. Responsible for and have authority to regulate and inspect all projects completed within the county.

   b. All projects funded by the state or federal government are designed by a consulting engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the consulting engineering company and is overseen by the county to ensure standards are met. Many county projects are designed with in-house expertise and engineers are consulted if problems arise.

   c. All funding in one-way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with other government agencies:

a. Local Agencies: The County Highway Department has little interaction with other county agencies concerning roads and bridges. They do, however, coordinate with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States Attorney's Office. The land values are usually developed by the Tax Equalization Office and approved by the County Commission.

b. Non-local Agencies: The County Highway Department coordinates with various State and Federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the Utah Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the Utah Historical Society.

4. General recommendations/Emergency Management concerns:

a. Wayne County Highway Department should assist local government with floodplain management and water development permitting.

b. Assist with a re-addressing project as needed.

C. Central Utah Public Health

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)

a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Central Utah Public Health (CUPH) will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.

b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.

c. Programs include; waste water treatment, water pollution, public health nursing, immunization programs, solid waste regulation, food establishment inspections, air quality, and vector control.

2. Responsibility and authority in the regulating, inspecting or funding of projects.

a. CUPH Health is a unit of state government that operates through agreements or Memorandums of Understanding with the Utah Department of Health to enforce state public health statutes within the Six County district. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies</u>: Within the scope of public health, CUPH coordinates with the following local agencies; Wayne County Emergency Management, Wayne County Emergency Medical Service, local law enforcement agencies (city and county), local school boards, and planning and zoning agencies.

   b. <u>Non-local Agencies:</u> Within the scope of public health, CUPH coordinates with the following agencies; Utah Department of Health and state and federal law enforcement agencies.

4. General recommendations/Emergency Management concerns:

   a. Public Health is normally under funded and understaffed at all levels of government. Should CUPH be called upon for expertise at a time of emergency or disaster, it normally does not have instrumentation for site level determinations of any kind without support from other agencies.

   b. Public health agencies should be included in equipment storage; e.g., FEMA equipment "stored" and used at public health agencies, rather than being stored at a warehouse. For example, radio equipment that belongs to FEMA is based at county emergency management offices; the same could be done with air sampling equipment or other instruments/kits etc., which could be used by public health agencies both for daily work and at a time of emergency or disaster.

D. <u>Wayne County Sheriff's Department</u>

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

   a. Responsible for law enforcement and criminal investigation in unincorporated areas of the county and in smaller towns that do not have police departments.

b. Provide standard law enforcement manpower and equipment.

c. In disaster situations, provide; warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.

d. Provide public awareness and educational programs. (911 education, safe kids program, etc.)

e. Have mutual aid agreements with all surrounding counties and the Utah State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:

a. None

3. Leadership and coordination with other government agencies:

a. Local Agencies: Within the scope of law enforcement, the Wayne County Sheriff's Department coordinates with various local agencies. These agencies include Wayne County Emergency Management and various local police departments.

b. Non-local Agencies: Wayne County Sheriff's Department coordinates with appropriate state and federal agencies including; Utah Highway Patrol, Utah Attorney Generals Office, Bureau of Criminal Identification, Utah Department of Transportation, National Park Service, National Forest Service, Bureau of Land Management and Federal Bureau of Investigation.

4. General recommendations/Emergency Management concerns:

a. Coordinate with and participate in local intra-agency planning and exercise endeavors.

E. Wayne Fire District

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

a. Respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.

b. Respond to accidents in order to provide rescue assistance.

c. Assist Emergency Medical Services in providing emergency assistance to sick and injured. (first responders)

d. Provide standard firefighting manpower and equipment.

e. Respond to spills and releases of hazardous materials and assist in mitigating the detrimental human and environmental effects of these occurrences.

f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.

g. Provide training for department members that will enable them to effectively and efficiently carry out their respective duties and responsibilities.

h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.

i. Assist in enforcement of city fire ordinances.

j. Fire investigation.

k. Provide assistance to other jurisdictions, as department resources and commitments allow. Wayne Fire District has mutual aid agreements with Juab, Millard, Piute, Sanpete and Sevier Counties.

l. Inspections and preplanning within the fire district to reduce hazards and aid in fire prevention.

m. Assist with the county's tier two reporting. (Hazardous materials storage sites)

n. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. None

3. Leadership and coordination with other government agencies:

   a. <u>Local Agencies:</u> In efforts to decrease vulnerability to hazards, the Wayne Fire District coordinates with various local agencies. These agencies include Wayne County Emergency Management, Wayne County Sheriff's Department, Loa Fire Department, Hanksville Fire Department, Lyman Fire Department, Torrey Fire Department, local Public Works, and local Emergency Medical Services.

b. Non-local Agencies: Utah State Fire Marshal and the Federal Emergency Management Agency, Dixie National Forest, Fishlake National Forest, National Park Service and Bureau of Land Management.

4. General recommendations/Emergency Management concerns:

Our district has seen an increase in number and variety of calls. As first responders, we have to train and equip our fire departments for various situations that may arise, such as: vehicle extrication, various types of hazardous materials, and many other types of responses. Each added type of response increases the need for equipment and the time our volunteers need to spend in training. With the recent decrease in population in our district, volunteer retention and recruitment is also a concern.

a. Seek funding outside of the district for additional equipment that will improve the effectiveness of our responses as well as increase the margin of safety for our volunteers.

b. Explore training options to cover the expanding variety of responses in our district.

c. Look into recruitment and retention programs that will work in our district.

F. Utah State University Extension Service *

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)

a. The Utah State University Extension Service provides practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.

b. County Extension Agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.

c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage clientele.

d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.

e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.

f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.

g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects:

   a. Authority is at federal level.

3. Leadership and coordination with other government agencies:

   a. Local Agencies: Wayne County Emergency Management and Central Utah Public Health.

   b. Non-local Agencies: Utah State University, Utah State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/Emergency Management concerns:

   a. None.

OTHER AGENCY RESOURCES

A. Mitigation and risk reduction:

1. Wayne County Social Services: Temporary assistance to needy families, food stamps, medically needy programs, adult services, homeless assistance, family planning, etc.

2. Army Corps of Engineers: Water and dam management within the county. Provide technical expertise, sandbags, and heavy equipment.

3. Utah Highway Patrol: Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

4. State Fire Marshal: Hazmat route utilization; HAZMAT technical assistance; situation and damage assessment.

5. Forestry, Fire & State Lands: Debris removal from recreational facilities; technical assistance; situation and damage assessment.

6. Utah Division of Wildlife Resources: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

7. State Radio Communications: Exercise readiness of warning systems and communication support.

8. Department of Agriculture: Assists with situation and damage assessment; coordination with USDA; HAZMAT technical assistance; state land use program.

9. Department of Workforce Services: Situation assessment and administration of disaster unemployment assistance programs.

10. Human Services: Insure liaison with private relief agencies for disaster victims.

11. State Historical Society: Project screening and situation assessment.

Annex 8 -- Prioritization of Mitigation Projects

Specific mitigation projects to minimize impact of potential natural hazards were developed by all 54 participating jurisdictions and two bands of the Paiute Indian Tribe of Utah (see Table 1). These projects were assigned a priority of high, medium, or low by the Six County PDM Core Planning Team using input from each jurisdiction and emergency manager in the Six County Region. Priorities were given taking into account the following factors:

- Number of people protected by the project
- Technical feasibility
- Political support
- Environmental impacts
- Available funding sources

A guiding factor in prioritizing mitigation was the thought that mitigation should provide the greatest amount of good to the greatest amount of people when cost was taken into account. Prioritizing mitigation was difficult in this plan since the Six County Region is vulnerable to many different hazards, each with its own characteristics. Thus, recurrence intervals, past events, damage estimates compiled during the assessing vulnerability section of this plan were also taken into account.

Table 1: Prioritization of Mitigation Projects

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Multihazard	Public Education to mitigate casualties.	High	Schools, Emergency Mgmt. (EM) in Six County Region	Counties, State, Federal	Entire Six County Region	$200,000/yr.	Ongoing	Increased ability to educate public of hazard risks and preparedness.
Multihazard	Educating Community Emergency Response Teams (CERTs).	High	EM in Six County Region, CERT Trainers	Counties, State, Federal	Entire Six County Region	$18,000/yr.	Ongoing	Increased ability to educate first responders of hazard risks and preparedness.
Multihazard	Update Zoning Ordinances to prevent development in identifiable hazardous areas.	High	EM and County Planning Staff in Six County Region	Counties, State, Federal	Entire Six County Region	Unknown	Depends on Funding	Prevents property damage and casualties due to hazards at moderate cost.
Multihazard	Join National Weather Service Strom Ready program.	Medium	EM in Six County Region	Counties NOAA	Entire Six County Region	Minimal	3 years	Participating jurisdictions will be ready for severe weather

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Earthquake	Seismically retrofit culinary water pipeline to withstand earthquake.	Medium	Levan Water Company	Unknown	Levan Town and Juab County	Unknown	Depends on Funding	Levan will still have adequate water after earthquake strikes.
Earthquake	Identify and Retrofit high risk public buildings and churches to prevent earthquake damage.	Low	EM in Six County Region, Building Inspectors	Cities, Towns, Counties, State, Federal	Entire Six County Region	$400,000,000	Depends on Funding	Will minimize property damage and casualties due to earthquake.
Flood	Adopt a No Special Flood Hazard Area (NSFHA) ordinance for certain municipalities outside of any floodplain.	Medium	Municipalities and Counties affected	Cities, Towns, Counties, State	Centerfield Town, Lynndyl Town	Unknown	Depends on Funding	Enables those municipalities at low risk to flood to concentrate on mitigating other hazards.
Flood	Build dike structure up to divert flood.	Medium	Juab County EM, Levan Town	County, State, Federal	Levan Town and Juab County	$5,000	Depends on Funding	Will prevent property damage and casualties due to flood.
Flood	Build debris basins on both Pigeon and Chicken Creeks. Protect the road and the culinary water line up Chicken Creek Canyon.	Medium	Juab County EM, Levan Town	County, State, Federal	Levan Town and Juab County	$3,000,000	Depends on Funding	Will alleviate flood damage to roads and water mains.
Flood	Build levees along the eastside drainage and a dyke on the west side of town to prevent flooding from Currant Creek and Mona Reservoir.	Medium	Juab County EM, Mona Town	County, State, Federal	Mona Town and Juab County	$400,000	Depends on Funding	Will help prevent property damage and casualties due to flood.
Flood	Install curb, gutter and storm drain system.	Medium	Juab County EM, Eureka City	City, County, State, Federal	Eureka City	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Evaluate and flood proof at risk buildings, particularly critical facilities.	Medium	Municipalities and Counties affected	City, Town, County, State, Federal	Fayette Town, Fountain Green City, Rocky Ridge Town, Wales Town	$70,000	Depends on Funding	Decreased risk of property damage and casualties due to flooding.

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Flood	Chalk Creek flood control Project.	High	Fillmore City, Millard County EM	City, County, State, Federal	Fillmore City, Millard County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Minor Flood Channeling along county roads.	Medium	Millard County Road Dept.	County, State, Federal	Millard County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Clean Scipio Canal.	Medium	Scipio Town, Millard County EM	Town, County, State, Federal	Scipio Town, Millard County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Build flood ponds for Marysvale Town.	Medium	Marysvale Town, Piute County EM	Town, County, State, Federal	Marysvale Town, Piute County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Construct flood control channel to divert flood from Revenue Gulch to Bullion Creek.	Medium	Marysvale Town, Piute County EM	Town, County, State, Federal	Marysvale Town, Piute County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Construct flood control dykes between Circleville Town and the Sevier River.	Medium	Circleville Town, Piute County EM	Town, County, State, Federal	Circleville Town, Piute County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Dredge Sevier River near Circleville Town.	Medium	Circleville Town, Piute County EM	Town, County, State, Federal	Circleville Town, Piute County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Construct flood control pond in Kingston Canyon	Medium	Kingston Town, Piute County EM	Town, County, State, Federal	Kingston Town, Piute County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Flood	Construct flood control levees along Uinta/Gammett and Fountain Green Creeks.	Medium	Fountain Green City, Sanpete County EM	City, County, State, Federal	Fountain Green City, Sanpete County	$1,000,000	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Extend existing levee at mouth of Wales Canyon south.	Medium	Wales Town, Sanpete County EM, FS	City, County, State, Federal	Wales Town, Sanpete County	$150,000	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Install SNOTEL site in the watershed of Canal Creek at 7,500' elevation.	Medium	State Division of Emergency Services (DES), Natural Resource Conservation Service (NRCS), Sanpete County	Cities, County, State, Federal	Ephraim, Mt. Pleasant, and Spring Cities, Sanpete County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Place a Stream Gauge on Canal Creek at the upper diversion.	Medium	State Division of Emergency Services (DES), Natural Resource Conservation Service (NRCS), Sanpete County	Cities, County, State, Federal	Ephraim, Mt. Pleasant, and Spring Cities, Sanpete County	Unknown	Depends on Funding	Increased ability to warn inhabitants in these cities; Decreased risk of property damage and casualties due to flooding.
Flood	Perform watershed calibration study and a FLO 2D study of Canal Creek.	Medium	State Division of Emergency Services (DES), Natural Resource Conservation Service (NRCS), Sanpete County	Cities, County, State, Federal	Ephraim, Mt. Pleasant, and Spring Cities, Sanpete County	Unknown	Depends on Funding	Increased ability to determine proper mitigation of flood risk; Decreased risk of property damage and casualties due to flooding.
Flood	Storm Water Management Plan/Infrastructures	Medium	Ephraim City, Sanpete County EM	City, County, State, Federal	Ephraim City, Sanpete County	$35,000	Depends on Funding	Increased ability to determine proper mitigation of flood risk; Decreased risk of property damage and casualties due to flooding.

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Flood	Construct flood channels in Ephraim City.	Medium	Ephraim City, Sanpete County EM	City, County, State, Federal	Ephraim City, Sanpete County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Construct channels for flood mitigation in Fairview City.	Medium	Fairview City, Sanpete County EM	City, County, State, Federal	Fairview City, Sanpete County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Purchase generator for 2nd water pump	Medium	Fairview City, Sanpete County EM	City, County, State, Federal	Fairview City, Sanpete County	$10,000	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Dig flood control ditch east of Fayette Town.	Medium	Fayette Town, Sanpete County EM	Town, County, State, Federal	Fayette Town, Sanpete County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Increase size of culvert pipe at Fayette Town.	Medium	Fayette Town, Sanpete County EM	Town, County, State, Federal	Fayette Town, Sanpete County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Level out creek bed to mitigate flooding in Gunnison.	Medium	Gunnison City, Sanpete County EM	City, County, State, Federal	Gunnison City, Sanpete County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Construct flood diversion canal at mouth of Manti Creek Canyon.	Medium	Manti City, Sanpete County EM	City, County, State, Federal	Manti City, Sanpete County	Unknown	Depends on Funding	Decreased risk of casualties and property damage to hydroelectric power plant and 50 homes ($5,250,000) due to flooding;
Flood	Dig flood control channels near Mt. Pleasant City.	Medium	Mt. Pleasant City, Sanpete County EM	City, County, State, Federal	Mt. Pleasant City, Sanpete County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Flood	Strengthen canal outside Aurora City.	Medium	Aurora City, Sevier County EM	City, County, State, Federal	Aurora City, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Build Utah Department of Transportation (UDOT) bridge above state canal north of Aurora City.	Medium	Aurora City, Sevier County EM, UDOT	City, County, State, Federal	Aurora City, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Rebuild flood retention ponds in Glenwood Town.	Medium	Glenwood Town, Sevier County EM	Town, County, State, Federal	Glenwood Town, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Update flood map for Glenwood Town	Medium	Glenwood Town, Sevier County EM, FEMA	Town, County, State, Federal	Glenwood Town, Sevier County	Unknown	Depends on Funding	Increased ability to determine proper mitigation of flood risk; Decreased risk of property damage and casualties due to flooding.
Flood	Perform a flood engineering study for Koosharem Town.	Medium	Koosharem Town, Sevier County EM	Town, County, State, Federal	Koosharem Town, Sevier County	Unknown	Depends on Funding	Increased ability to determine proper mitigation of flood risk; Decreased risk of property damage and casualties due to flooding.
Flood	Construct concrete barriers and built up beams in Joseph Town.	Medium	Joseph Town, Sevier County EM	Town, County, State, Federal	Joseph Town, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Upgrade existing culverts to mitigate flood in Salina City.	Medium	Salina City, Sevier County EM	City, County, State, Federal	Salina City, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Install storm drain system in Redmond Town.	Medium	Redmond Town, Sevier County EM	Town, County, State, Federal	Redmond Town, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Flood	Maintain flood retention walls for Richfield City.	Medium	Richfield City, Sevier County EM	City, County, State, Federal	Richfield City, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Upgrade storm drain system in Richfield City.	Medium	Richfield City, Sevier County EM	City, County, State, Federal	Richfield City, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Construct small debris basin in Bertelson Canyon to mitigate flooding in Monroe City.	Medium	Monroe City, Sevier County EM	City, County, State, Federal	Monroe City, Sevier County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Span culinary water lines over Sand Creek to avoid flood damage to lines.	Medium	Torrey Town, Wayne County EM	Town, County, State, Federal	Torrey Town, Wayne County	Unknown	Depends on Funding	Decreased risk of damage to culinary water lines due to flooding.
Flood	Construct culverts to prevent washing out north of Bicknell.	Medium	Bicknell Town, Wayne County EM	Town, County, State, Federal	Bicknell Town, Wayne County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Install larger pipe on Bull Creek in Hanksville Town.	Medium	Hanksville Town, Wayne County EM	Town, County, State, Federal	Hanksville Town, Wayne County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Upgrade flood dyke that drains into Bull Creek.	High	Hanksville Town, Wayne County EM	Town, County, State, Federal	Hanksville Town, Wayne County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Improve drainage system to prevent flooding in Hanksville Town.	Medium	Hanksville Town, Wayne County EM	Town, County, State, Federal	Hanksville Town, Wayne County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Flood	Construct new reservoir to prevent flooding in Lyman Town.	Medium	Lyman Town, Wayne County EM	Town, County, State, Federal	Lyman Town, Wayne County	Unknown	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Improve High Line Ditch to increase its flood capacity	Medium	Lyman Town, Wayne County EM	Town, County, State, Federal	Lyman Town, Wayne County	$300,000	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Flood	Construct a mile long deflector levee.	Medium	Lyman Town, Wayne County EM	Town, County, State, Federal	Lyman Town, Wayne County	$300,000	Depends on Funding	Decreased risk of property damage and casualties due to flooding.
Landslide	Monitor landslide zones for movement threatening subdivisions to better warn inhabitants of danger.	Medium	EM in Six County Region.	Counties, State, Federal	Entire Six County Region	Unknown	Depends on Funding	Decreased risk of casualties due to landslides, enhanced warning for inhabitants.
Wildfire	Participate in the Utah Living with Fire Program. Particularly, at risk communities as identified in the National Fire Plan should be involved.	Medium	County Fire Wardens, FFSL, EM in Six County Region	Counties, State	Entire Six County Region	Minimal	2006	Decreased risk of property damage and casualties due to uncontrolled wildfires.
Wildfire	County ordinances requiring defensible space, water source development, proper road width and escape routes in fire prone areas.	High	County Fire Wardens, LEPC, County Zoning Commissions	Counties, State	Hotspots throughout Six County Region	$30,000	2005	Decreased risk of property damage and casualties due to uncontrolled wildfires.
Wildfire	Establish defensible space around forest and city structures, water source development, escape routes, and controlled burns.	High	Forest Service (FS), BLM, County Fire Wardens, State Forestry, Fire and State Lands (FFSL), LEPC, Homeowners Associations	National Fire Plan (NFP), Healthy Forests Initiative (HFI)	Hotspots throughout Six County Region	$45,000,000	Depends on Funding	Decreased risk of property damage and casualties due to uncontrolled wildfires.

Hazard	Project	Priority	Responsible Agency	Possible Funding Sources	Jurisdiction Affected	Estimated Project Cost	Estimated Completion Date	Benefits
Dam Failure	Regularly monitor high hazard dams, strengthening them when necessary.	High	Local Water Companies, LEPC, Utah Department of Natural Resources (DNR)	Counties, Utah DNR, Federal	High Hazard Dams identified in each county annex.	Unknown	Depends on Funding	Increased ability to prevent dam failure and warn public of impending dam failure.
Drought	Develop additional water sources and storage as well as implement conservation plans.	High	Kanosh Band Water Company	State, Federal	Kanosh Band, Paiute Tribe of Utah	Unknown	Depends on Funding	Reduces risk of crop damage from drought.
Severe Weather	Plant trees west of towns at high risk of windstorms.	Medium	Towns, County EM	Towns, County, State, Federal	Hinckley, Lynndyl, and Oak City Towns in Millard County	Unknown	Depends on Funding	Reduces risk of damage and casualties due to windstorms.

Appendix - A

Hazard Definitions

Flooding

Flooding is a temporary overflow of water onto lands not normally inundated by water producing measurable property damage or forcing evacuation of people and vital resources. Floods frequently cause loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss, and interruption of business. Floods also increase the likelihood of hazard such as transportation accidents, contamination of water supplies, and health risk increase after a flooding event.

Several factors determine the severity of floods including rainfall intensity, duration and rapid snowmelt. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can also result in flooding at locations where the soil has been previously saturated or if rain concentrates in an area having, impermeable surfaces such as large parking lots, paved roadways, or post burned areas with hydrophobic soils. Topography and ground cover are also contributing factors for floods. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover.

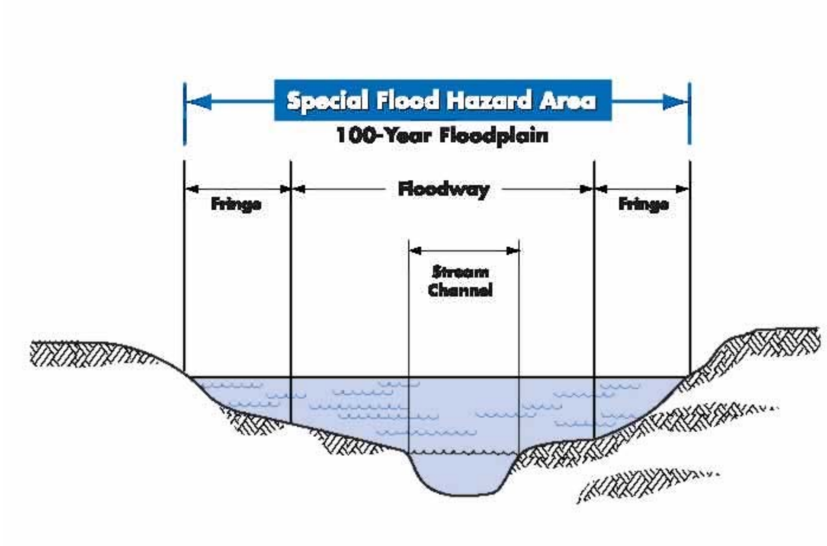
Frequency of inundation depends on the climate, soil, and channel slope. In regions where substantial precipitation occurs during a particular season or in regions where annual flooding is due to spring melting of winter snow pack, areas at risk may be inundated nearly every year.

Conditions that may exacerbate floods:
Impermeable surfaces
Steeply sloped watersheds
Constrictions
Obstructions
Debris
Contamination
Soil saturation
Velocity

Explanation of Common Flood Terms **Figure A-1**

FIRM: Flood Insurance Rate Map

100-year flood (see Figure A-1): Applies to an area that has a 1 percent chance, on average, of flooding in any given year. However, a 100-year flood could occur two years in a row, or once every 10 years. The 100 year-flood is also referred to as the base flood.



Base Flood: Is the standard that has been adopted for the NFIP. It is a national standard that represents a compromise between minor floods and the greatest flood likely to occur in a given area and provides a useful benchmark.

Base Flood Elevation (BFE): As shown on the FIRM, is the elevation of the water surface resulting from a flood that has a 1% chance of occurring in any given year. The BFE is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum (NGVD) or 1929, the North American Vertical Datum (NAVD) of 1988, or other datum referenced in the FIS report.

National Flood Insurance Program (NFIP): The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods.

Special Flood Hazard Area (SFHA): Is the shaded area on a FIRM that identifies an area that has a 1% chance of being flooded in any given year (100-year floodplain).

Floodway: Is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without raising that water surface elevation by more than one foot.

Earthquakes

An earthquake is the abrupt shaking of the earth caused by the sudden breaking of rocks when they can no longer withstand the stresses, which build up deep beneath the earth's surface. The rocks tend to rupture along weak zones referred to as faults. When rocks break they produce seismic waves that are transmitted through the rock outward producing ground shaking. Earthquakes are unique multi-hazard events, with the potential to cause huge amounts of damage and loss. Secondary effects of a sudden release of seismic energy (earthquake) include: ground shaking, surface fault rupture, liquefaction, tectonic subsidence, slope failure, and various types of flooding.

The Intermountain Seismic Belt
The Intermountain Seismic Belt (ISB), which Six County is part of, is a zone of pronounced earthquake activity up to 120 miles wide extending in a north south direction 800 miles from Montana to northern Arizona. The Utah portion of the ISB trends from the Tremonton Cache Valley area south through the center of the state, along the Wasatch Front, and the southwest through Richfield and Cedar City concluding in St. George. "The zone generally coincides with the boundary between the Basin and Range physiographic province to the west and the Middle Rocky Mountains and Colorado Plateau physiographic provinces to the east" (Eldredge 6).

Secondary Earthquake Threats
The major secondary effects of earthquakes include: ground shaking, surface fault rupture, liquefaction, tectonic subsidence, avalanches, rock fall, slope failure, and various types of flooding. Other sections discuss landslides, and flooding therefore they will not be discussed under secondary effects of earthquakes yet importance needs to be given to the fact that earthquakes can increase the likelihood of flooding and landslides.

Ground Shaking
Ground shaking causes the most impact during an earthquake because it affects large areas and is the origin of many secondary effects associated with earthquakes. Ground shaking, which generally lasts 10 to 30 seconds in large earthquakes, is caused by the passage of seismic waves generated by earthquakes. Earthquake waves vary in both frequency and amplitude. High frequency low amplitude waves cause more damage to short stiff structures, were as low frequency high amplitude waves have a greater effect on tall (high-rise) structures. Ground shaking is measured using Peak Ground Acceleration (PGA). The PGA measures the rate in change of motion relative to the established rate of acceleration do to gravity.

Local geologic conditions such as depth of sediment and sediment make up, affect earthquake waves. Deep valley sediments increase the frequency of seismic waves relative to bedrock. In general, ground shaking increases with increased thickness of sediments" (Eldredge 8). Findings in recent geologic research done by Ivan Wong indicate and earthquake in Salt Lake County would produce higher PGA values than previously expected near faults and areas of near surface bedrock.

Surface Fault Rupture
During a large earthquake fault movement may propagate along a fault plain to the surface, resulting in surface rupture along the fault plain (see Picture A-1). The Wasatch fault is a normal (mountain building) fault with regards to movement, meaning the footwall of the fault moves upward and the hanging wall moves in a down direction. Thus faulting is on a vertical plain, which results in the formation of large fault scarps. Surface fault rupture along the Wasatch fault is expected for earthquakes with magnitudes of 6.5 or larger. The largest probable earthquake that could strike the Six County region is an earthquake with an estimated magnitude between 7.0 and 7.5; an earthquake of this magnitude, based on current research, would create "surface fault rupture with a displacement of between 16 to 20 feet in height with break segments 12 to 44 miles long" (Eldredge 10). In historic time surface fault rupture has only occurred once in Utah; the 1934 Hansel Valley earthquake with a magnitude 6.6 produced 1.6 feet of vertical offset.

Surface fault rupture presents several hazards, anything built on top of the fault or crossing the fault has a high potential of destroyed in the event of displacement. Foundations will be cracked, building torn apart, damage to roads, utility lines, pipelines, or any other utility line crossing the fault. It is almost impossible to design anything within reasonable cost parameters to with stand an estimated displacement of 16 to 20 feet.

Picture A-1: Displacement in excavation

Surface fault rupture doesn't occur on a single distinct plain; instead it occurs over a zone often several hundred feet wide known as the zone of deformation. This zone of deformation occurs mainly on the down thrown side of the main fault trace. Tectonic subsidence, caused by antithetic faults moving in the opposite direction of the main fault, slide down hill on the main fault scarp creating grabens (down dropped blocks) within the zone of deformation.

Liquefaction
Soil liquefaction occurs when water-saturated cohesion less sandy soils are subject to ground shaking. When liquefaction occurs soils behave more like a viscous liquid (quicksand) and lose their bearing capacity and shear strength. Two conditions must be met in order for soils to liquefy: (1) the soils must be susceptible to liquefaction (sandy, loose, water-saturated, soils typically between 0 and 30 feet below the ground surface) (2) ground shaking must be strong enough to cause susceptible soils to liquefy (lips). The loss of shear strength and bearing capacity due to liquefaction causes buildings to settle or tip and light buoyant structures such as buried storage tanks and empty swimming pools to float upward. Liquefaction can occur during earthquakes of magnitude 5.0 or greater.

Lateral Spread
Soils, once liquefied, can flow on slopes with angles of .5 to 5 percent this movement of liquefied soils is known as lateral spread. "The surficial soil layers break up and sections move independently, and are displaced laterally over a liquefied layer" (Eldredge 10). Liquefaction can cause damage in several ways, with lateral spreading being one of the most common. Displacement of three (3) or more feet may occur and be accompanied by ground cracking and vertical displacement. Lateral spreading causes roads, buildings, buried utilities, and any other buried or surface structure to be pulled apart.

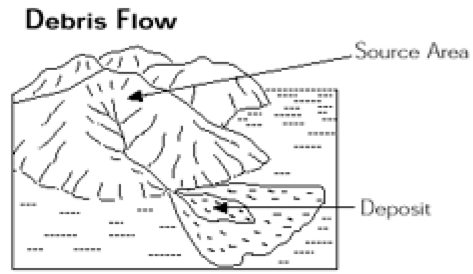
Various Flooding Issues Related to Earthquakes
Earthquakes could cause flooding due to the tilting of the valley floor, dam failure and seiches in lakes and reservoirs. Flooding can also result from the disruption of rivers and streams. Water tanks, pipelines, and aqueducts may be ruptured, or canals and streams altered by ground shaking, surface faulting, ground tilting, and land sliding.

Seiches
Standing bodies of water are susceptible to earthquake ground motion. Water in lakes and reservoirs may be set in motion and slosh from one end to the other, much like in a bathtub. This motion is called a seiche (pronounced “saysh”). A seiche may lead to dam failure or damage along shorelines.

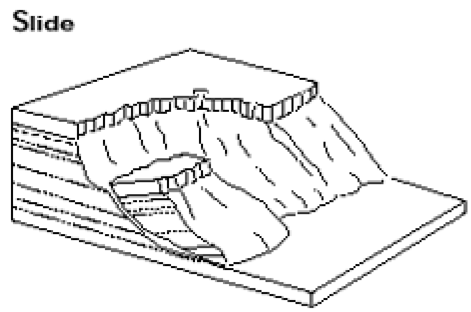
Landslides

Landslides are a “down slope movement of a mass of rock, earth, or debris”. Landslides, often referred to as mass wasting or slope failures, are one of the most common natural disasters. (Cruden 36). Slope failures can vary considerably in shape, rate of movement, extent, and effect on surrounding areas. Slope failures are classified by there type of movement, and type of material. The types of movement are classified as falls, slides, topples, and flows. “The types of material include rock, debris (coarse grained soil) and earth (fine grained soil)” (Eldredge 17). “Types of slope failures then are identified as rock falls, rock slides, debris flows, debris slides, and so on” (Eldredge 17). Slope failures occur because of either an increases in the driving forces (weight of slope and slope gradient) or a decrease in the resisting forces (friction, or the strength of the material making up a slope). “Geology (rock type and structure), topography (slope gradient), water content, vegetative cover, and slope aspect are important factors of slope stability” (Eldredge 18).

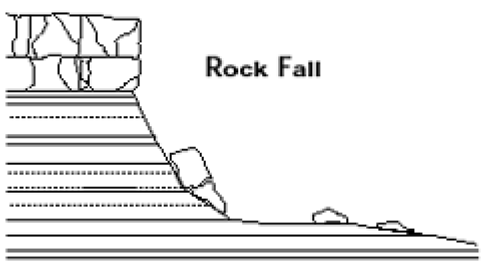
Figure A-2: Three Common Types of Landslides in Utah



Debris flows consist of sediment-water mixtures that flow down a streambed or hillside, commonly depositing sediment at canyon mouths in fan like deposits know as alluvial fans.



Slides are down slope movements of soil or rock on slopes.



Rock falls consist of rock(s) falling from a cliff or cut slope and are very common in the canyon country of southern Utah.

Conditions That Make Slopes More Susceptible to Landslides

- Discontinuities: faults, joints, bedding surfaces.
- Massive Materials over soft materials.
- Orientations of dip slope: bedding plans that dip out of slope.
- Loose structure and roundness.
- Adding weight to the head of a slide area: rain, snow, landslides, mine waste piles, buildings, leaks from pipes, sewers, and canals, construction materials fill materials.
- Ground shaking: earthquakes or vibrations.
- Increase in lateral spread caused by mechanical weathering.
- Removal of lateral support.
- Human activities: cut and fill practices, quarries, mine pits, road cuts, lowering of reservoirs.
- Removing underlying support: under cutting of banks in a river.
- Increase in pore water pressure: snow melt, rain, and irrigation.
- Loss of cohesion.

Wildfire

Identifying Hazards
A wildfire is an uncontrolled fire spreading through vegetative fuel often exposing or consuming structures. Wildfires often begin unnoticed and spread quickly and are usually sighted by dense smoke. Wildfires are placed into two classifications Wildland and Urban-Wildland Interface. Wildland fires are those occurring in an area where development is essentially nonexistent, except for roads, railroads, or power lines. Urban-Wildland Interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. URWIN areas are divided into three subclasses, each evident in counties within Six County:

- **Occluded**
  Occluded interface, are areas of wild lands within an urban area for example a park bordered by urban development such as homes.

- **Intermixed**
  Mixed or intermixed interface areas contain structures scattered throughout rural areas covered predominately by native flammable vegetation.

- **Classic**
  Classic interface areas are those areas where homes press against wildland vegetation along a broad front.

When discussing wildfires it is important to remember that fires are part of a natural process and are needed to maintain a healthy ecosystem. Three basic elements are needed for a fire to occur (1) a heat source (2) oxygen and (3) fuel. Two of the three sources are readily available in the counties making up the Six County region. Major ignition sources for wildfire are lightning and human causes such as arson, recreational activities, burning debris, and carelessness with fireworks. On average, 65 percent of all wild fires started in Utah can be attributed to human activities. Once a wildfire has started, vegetation, topography and weather are all conditions having an affect wildfire behavior.

Severe Weather

For the purpose of this mitigation plan the term severe weather is used to represent downbursts, lightning, heavy snowstorms, blizzards, avalanches, hail, and tornados.

Downbursts
A downburst is a severe localized wind, blasting from a thunderstorm. Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories by size. Microburst, which cover an area less than

2.5 miles in diameter, and macro burst, which cover an area with a diameter larger 2.5 miles.

Lightning
During the development of a thunderstorm, the rapidly rising air within the cloud, combined with the movement of the precipitation within the cloud, causes electrical charges to build. Generally, positive charges build up near the top of the cloud, while negative charges build up near the bottom. Normally, the earth's surface has a slight negative charge. However, as the negative charges build up near the base of the cloud, the ground beneath the cloud and the area surrounding the cloud becomes positively charged. As the cloud moves, these induced positive charges on the ground follow the cloud like a shadow. Lightning is a giant spark of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges. When the potential between the positive and negative charges becomes too great, there is a discharge of electricity that we know as lightning.

Heavy Snowstorms
A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. According to the official definition given by the U.S. Weather Service, the winds must exceed 35 miles per hour and the temperature must drop to 20° F or lower. All winter storms make driving extremely dangerous.

Blizzards
A blizzard is a snowstorm with sustained winds of 40 miles per hour (mph) or more or gusting winds up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening travel conditions. The definition includes the conditions under which dry snow, which has previously fallen, is whipped into the air and creates a diminution of visual range.

Avalanches
Avalanches are a rapid down-slope movement of snow, ice, and debris. Snow avalanches are a significant mountain hazard in Utah, and nationally account for more deaths each year than earthquakes. Avalanches are the result of snow accumulation on a step slope and can be triggered by ground shaking, sound, or a person. Avalanches consist of a starting zone, a track, and a run-out zone. The starting zone is where the ice or snow breaks loose and starts to slide. The Track is the grade or channel down which an avalanche travels. The run-out zone is where an avalanche stops and deposits the snow.

The two main factors affecting avalanche activity include weather and terrain, large frequent storms combined with steep slopes result in avalanche danger. Additional factors that contributing to slope stability are amount of snow, rate of accumulation, moisture content, snow crystal types and the wind speed and direction. In Utah, the months of January through April have the highest avalanche risk.

Topography plays a vital role avalanche dynamics. Slope angles between 30 to 45 degrees are optimum for avalanches with 38 degrees being the bulls-eye. Slopes with an angle above 45 degrees continually slough eliminating large accumulation. The risk of avalanches decreases on slope angles below 30 degrees.

Types of Avalanches Common in Utah:

Dry or slab avalanches: occur when a cohesive slab of snow fractures as a unit and slides on top of weaker snow, breaking apart as it slides. Slab avalanches occur when additional weight is added quickly to the snow pack, overloading a buried weaker layer. Dry snow avalanches usually travel between 60-80 miles per hour, reaching this speed within 5 seconds of the fracture, resulting in the deadliest form of snow avalanche.

Wet avalanches: occur when percolating water dissolves the bonds between the snow grains in a pre-existing snow pack, this decrease the strength of the buried weak layer. Strong sun or warm temperatures can melt the snow and create wet avalanches. Wet avalanches usually travel about 20 miles per hour.

Hail Storms

Hailstones are large pieces of ice that fall from powerful thunderstorms. Hail forms when strong updrafts within, the convection cell of a cumulonimbus cloud carries water droplets upward causing them to freeze. Once the droplet freezes, it collides with other liquid droplets that freeze on contact. These rise and fall cycles continue until the hailstone becomes too heavy and falls from the cloud.

Tornados

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. Tornados often occur at the edge of an updraft or within the air coming down from a thunderstorm. Tornadoes can have wind speeds of 250 miles per hour or more, causing a damage zone of 50 miles in length and 1 mile wide. Most tornados have winds less than 112 miles per hour and zones of damage less than 100 feet wide

Waterspout

Waterspouts are simply tornadoes that form over warm water. This typically occurs in Utah during a cold fall or late winter storms.

Scale

Tornadoes are classified by wind damage using the Fujita Scale (see Table A-1). The National Weather Service has used the Fujita Scale since 1973. This scale uses numbers from 0 through 5 with higher numbers assigned based on the amount and type of wind damage.

Table A-1: Fujita Scale

Category F0	Gale tornado (40-72 mph)	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
Category F1	Moderate tornado (73-112 mph)	Moderate damage. The lowers limit is the beginning of hurricane wind speed; peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
Category F2	Significant tornado (113-157 mph)	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
Category F3	Severe tornado (158-206 mph)	Severe damage. Roofs and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
Category F4	Devastating tornado (207-260 mph)	Devastating damage. Well-constructed houses leveled; structure with weak foundation blown off some distance; cars thrown and large missiles generated.
Category F5	Incredible tornado (261-318 mph)	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobiles-size missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur.

Drought

Drought is a normal recurrent feature of climate, although many, in Utah, erroneously consider it a rare and random event. It occurs in virtually all-climatic zones, while its characteristics vary significantly from one region to another. Droughts, simple put, are cumulative hazards, which result from long periods of below normal precipitation. Drought is a temporary aberration and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate.

The State or Utah, uses the Palmer Drought Severity Index or (PDSI) to quantify the existence of a drought. Using the PDSI, drought is expressed as a negative number. Much of the basis, used by the State, to determine drought years, or drought periods, comes from the PDSI. In addition, the State Climatologist, the National Geophysical

Data Center of NOAA, and the National Drought Mitigation Center use the PDSI. Further information on the Palmer Drought Severity Index can be found in Appendix F.

For the most part droughts no longer affect the availability of drinking water, thus no longer place peoples lives at risk, the same can not be said for a persons livelihood. Numerous water projects throughout the state have place enough water in storage to insure drinking water. Prolonged droughts have a significant affect on agricultural and agribusinesses, within the state dependent on irrigation water. Droughts also stress wildlife, and heighten the risk of wildfire.

Dam Failure

Dam failures result from the failure of a man made water impoundment structure, which often results in catastrophic down grade flooding. Dam failures are caused by one or a combination of the following: “breach from flooding or overtopping, ground shaking from earthquakes, settlement from liquefaction, slope failure, internal erosion from piping, failure of foundations and abutments, outlet leaks or failures, vegetation and rodents, poor construction, lack of maintenance and repair, misuse, improper operation, terrorism, or a combination of any of these” (Eldredge 46). The Utah State Engineer has been charged with regulating non-federal dams in the State dams since 1919. “In the late 1970's Utah started its own Dam Safety Section within the State of Utah Engineers Office to administer all non-federal dams in response to the Federal Dam Safety Act (PL-92-367)” (Eldredge 46).

The State Dam Safety Section has developed a hazard rating system for all non-federal dams in Utah. Downstream uses, the size, height, volume, and incremental risk/damage assessments or dams are all variables used to assign dam hazard ratings in Dam Safety’s classification system. Using the hazard ratings systems developed by the Dam Safety Section, dams are placed into one of three classifications high, moderate, and low. Dams receiving a low rating would have insignificant property loss do to dam failure. Moderate hazard dams would cause significant property loss in the event of a breach. High hazard dams would cause a possible loss of life in the event of a rupture. The frequency of dam inspection is designated based on hazard rating with the Division of Water Rights inspecting high-hazard dams annually, moderate hazard dams biannually, and low-hazard dams every five years. There are 134 dams within Six County of those 26 have received a high hazard rating by Dam Safety.

Problem Soils

Problem soils and rock constitute a widespread geologic hazard in Utah, covering approximately 18 to 20 percent of the state, and underlie many urbanized areas. The nine types of problem soil and rock in Utah are:

- Expansive Soil
- Collapsible Soil

- Limestone and Karst Terrain
- Gypsiferous Soil
- Soil Subject to Piping
- Dunes
- Peat
- Mine Subsidence
- Sodium Sulfate

Problems soils affecting the Six County region include expansive soil and rock, limestone and karst terrain, silica dunes, and gypsum dunes.

Expansive Soil and Rock
Clay minerals found in soils and rock expand and contract due to changes in moisture content. The most common clay mineral associated with expansive soils in Utah is montmorillonite, "which expands up to 2,000 times its original size, and can exert pressures up to 11,000 pounds per square foot" (Eldredge 30). The cracks created by the expansion and contraction process create a positive feed back mechanism that allows more water to enter during the next storm cycle. Within the Six County Region expansive soils are found along the eastern foothills and within Wayne County, which has vast areas of exposed macos shale. Problems associated with expansive materials are cracked foundations, heaving and cracking of road surfaces, failure of wastewater disposal systems, and broken water lines.

Collapsible Soil
Collapsible soil causes ground-surface subsidence when loose, dry, low density deposits decrease in volume when saturated for the first time since deposition. Frequently the water introduced into these soils is from human sources such as irrigation, water impoundment, lawn watering, alterations to natural drainages, and/or wastewater disposal.

Limestone and Karst Terrain
Closed depressions, caverns, and streams that abruptly disappear underground are characteristics of karst terrain. Limestone, dolomite, and gypsum are all common in the Six County region and susceptible to dissolution by ground water and surface water thus forming karst terrain. Karst features affect surface and subsurface drainage causing a collapse of the ground surface and often the contamination of ground water. The cavernous nature of the terrain allows surface or subsurface sources of pollution from landfills, waste water disposal systems, and buried gasoline tanks to enter the groundwater system.

Gypsiferous Soil
Gypsum is a primary component in some rocks, and the soils derived from them. Gypsiferous deposits, when wetted, are subject to settlement, causing sinkholes similar to those found in karst terrains. Weathered gypsum forms sulfuric acid and sulphate, which

reacts with certain types of cement often weakening foundations. Gypsum is also a week material with a low bonding strength.

Piping

Piping is a type of subsurface erosion caused by ground water moving along a permeable layer in unconsolidated materials and exiting at a free face, which intersects the unconsolidated layer. The movement of underground water removes fine-grained particles (silts and clay) creating subsurface voids, which act like channels directing the movement of water. These channels increase in size, as more and more water is collected, until the walls and roof can no longer support the weight and collapse. Over time this process forms a gully, which further concentrates erosion.

Dunes

Dunes form when sand derived from weathered rock or an unconsolidated deposit is blown by the wind into mounds or ridges. Migrating dunes can bury roads, and structures, clog waste and storm water systems, and cause contamination of local ground water.

In Utah, three types of material commonly form dunes: silica, gypsum, and oolites.

Silica Dunes comprised mainly of silica, are typically found along the western side mountain ranges in western Utah.

Gypsum Dunes are principally derived from the evaporation of playas and are found in Great Salt Lake Desert and along the lee side of many playas in the basins west of Delta.

Oolitic Dunes are composed of calcium carbonate, which is generally precipitated around brine shrimp fecal pellets. Oolitic dunes form in shallow water areas of the Great Salt Lake and are reworked by wind during low water lake cycles.

Many inactive or vegetated dunes in Utah are being reactivated by development and motorized recreation. Once dunes are denuded of there vegetation they begin to migrate once again.

Mine Subsidence

Utah has a long history of mining and there are numerous mines within Utah. Mining removes rock and leaves voids that, if not supported, can collapse and cause subsidence of the ground surface and sinkholes. Subsidence can occur in both active and abandoned mines.

Peat

Peat consists of partially decomposed plant remains. Peat usually accumulated in areas of shallow ground water and near standing water where oxygen depletion limits organic decay. Hazards associated with peat can include subsidence when water is removed, oxidations, and compression and settlement under. Peat deposits are considered a localized hazard occurring primarily along the shores of the Great Salt Lake, Utah Lake, and low lying areas formerly occupied by Lake Bonneville. Mountainous areas commonly have localized small areas of peat, forming in head scarps created by landslides and behind glacial moraines. (Eldredge 33)

Sodium Sulfate

Sodium Sulfate is derived from the evaporation of playas and for the weathering of bedrock. "Soils with high concentrations of water-soluble sulfates exhibit an expansive phenomenon resembling that of expansive clays and frost heave." (Eldredge 33)

Appendix - B
Vulnerability Analysis

Table 1: Juab County

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Critical Facilities											
Callao Fire Dept	GIS	X								60	
Central Valley Medical Nephi	GIS	X	X			X				300	
Eureka Fire Dept		X								100	
Granite Ranch Fire Dept Trout Creek		X								50	
Juab County Sheriff's Nephi	GIS	X								200	
Levan Fire Dept	HAZUS MH	X								100	
Mona Fire Dept	GIS	X								100	
Nephi Fire Dept	HAZUS MH	X								150	
Nephi Fire Dept	GIS	X								150	
Rocky Ridge Fire Dept		X								65	
Care Facilities											
Canyon View Country Homes	HAZUS MH	X	X			X	X			200	
Schools											
District Office Nephi		X				X				100	
Mona School		X	X							300	
Nephi School	GIS	X	X							300	
Juab Middle School Nephi	GIS	X								600	
Juab High School Nephi	GIS	X								1,000	
Eureka School	GIS	X	X							300	
Tintic High Eureka	GIS	X								900	
Hazardous Material Storage Sites											
Ash Grove Cement	GIS			X			X			100	
Nephi Rubber Products	GIS			X			X			200	
Sunshine Mining Co	HAZUS HM			X			X			200	
Doyles Diesel	HAZUS HM			X			X			150	
Utah Power and Light	HAZUS HM			X			X			200	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Envirochem Sevices				X			X			100	
Chevron Nephi Bulk Plant				X			X			200	
AT&T Levan				X			X			60	
Utah Foam Products				X			X			60	
Power Substations											
Eureka Substation					X					10,000	
Mona Substation					X					20,000	
Nebo Substation					X					10,000	
Martin Marietta Substation					X					10,000	
Ockey Substation					X					10,000	
Vickers Substation					X					10,000	
Thermoid Substation					X					10,000	
Nephi Substation					X					10,000	
Soma Substation					X					10,000	
Juab Substation					X					10,000	
Mills Substation					X					10,000	
Costal States Energy					X					10,000	
Levan Substation					X					10,000	
Chief Cons Mining Substation					X					10,000	
Companies Employing Greater than 50 People											
Utah State University Range						X				100	
Quality Craft Woodworks						X				60	
Central Valley Medical Center						X				300	
Denny's Restaurant						X				150	
Heritage Hills Health Care						X				150	
JC Mickelson's Restaurant						X				150	
Juab School District						X				N/A	
Nephi Rubber Products						X				200	
Mid-State Consultants						X				100	
Mt. Nebo Thriftway						X				150	
Rural Health Management						X				80	
Sunset Rail						X				100	

Table 2: Millard County

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Critical Facilities											
Hospital Delta Community Medical Delta		X	X			X	X			1,000	
Delta Fire Department Delta	GIS	X								200	
Eskdale Fire Department Eskdale		X								100	
Fillmore Fire Department Fillmore		X								200	
Fillmore Medical Center Fillmore		X	X			X				1,000	
Garrison Fire Department Garrison		X								100	
Hinckley Fire Department Hinckley	GIS	X								100	
Holden Fire Department Holden	HAZUS MH	X								100	
Kanosh Fire Department Kanosh	GIS	X								100	
Leamington Fire Dept. Leamington	HAZUS MH	X								100	
Lynndyl Fire Dept Lynndyl	HAZUS MH	X								80	
Meadow Fire Dept Meadow	GIS	X								100	
Oak City Fire Dept Oak City	GIS	X								80	
Scipio Fire Dept. Scipio		X								100	
Care Facilities											
West Millard Care Center Delta		X	X				X			200	
Pleasant Acres for Elderly Delta		X	X				X			150	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Schools											
District Office Millard District Delta		X								100	
Delta North School		X	X							300	
Delta South School		X	X							300	
Fillmore School		X	X							300	
Delta Middle School Delta		X								600	
Fillmore Middle School		X								600	
Delta High		X								1,000	
Millard High Fillmore		X								1,000	
Hazardous Materials Storage Sites											
Flowell Electric				X						100	
County USDA Extension				X						100	
Chevron Fillmore Bulk Plant				X						100	
Brush Wellman Inc				X						100	
Losee Moving and Storage				X						100	
AT&T Clearlake				X						100	
Intermountain Generation Stat.				X						1,000	
AT&T Delta				X						100	
Ershing Inc				X						100	
Western Technologies Inc				X						100	
Rollings Envr				X						100	
AT&T Delta				X						100	
AT&T Scipio				X						100	
AT&T Confusion Mtn.				X						100	
Power Substations											
Pahvant Substation	HAZUS MH				X					10,000	
Mother Earth Substation					X					10,000	
Clear Lake Substation	HAZUS MH				X					10,000	
Cricket Substation	HAZUS MH				X					10,000	
Sunstone Substation	GIS				X					10,000	
Delta Mill Substation	GIS				X					10,000	
Delta Substation	GIS				X					10,000	
Continental Lime Substation	GIS				X					10,000	
McCormick Substation	GIS				X					10,000	
North Fields Substation	GIS				X					10,000	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Fool Creek Substation	GIS				X					10,000	
Lynndyl Substation	GIS				X					10,000	
Brush Beryllium Substation	GIS				X					10,000	
Southerland Substation	HAZUS HM				X					10,000	
Scipio Substation	HAZUS HM				X					10,000	
Intermountain Power Substation	HAZUS HM				X					20,000	
DMAD IPP Pump Substation					X					20,000	
Oak City Substation					X					10,000	
Holden IRR substation					X					10,000	
Fillmore SW. RK. Substation					X					10,000	
Fillmore T.V. Substation					X					10,000	
Fillmore City Substation					X					10,000	
Flowell Subtation					X					10,000	
IPP Substation					X					20,000	
IPP Mancamp Substation					X					20,000	
Flowell REA Substation					X					10,000	
Brush Wellman Substation					X					10,000	
Companies Employing Greater Than 50 People											
Quality Thriftway Delta						X				100	
West Millard Care Center Delta						X				200	
Fillmore Community Care Fillmore						X				200	
Pictsweet Mushroom Farm Fillmore						X				250	
Ash Grove Cement Fillmore						X				150	
Dunn's Wildhorse Resort Scipio						X				100	

Table 3: Piute County

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Critical Facilities											
Circleville Fire Dept.		X								100	
Junction Fire Dept.	GIS	X								100	
Marysvale Fire Dept.		X								100	
Piute County Sheriff's Junction		X								200	
Schools											
District Office Piute		X								150	
Circleville School Circleville		X	X							300	
Oscarson School Marysvale	GIS	X	X							300	
Piute High Junction	HAZUS MH	X								500	
Hazardous Material Storage Sites											
Smoots Irrigation	GIS									100	
Power Substations											
Circleville Substation					X					10,000	
Junction Substation					X					10,000	
Mineral Products Substation					X					10,000	
Marysvale Substation					X					10,000	
Dear Trail Substation					X					10,000	
Parker Mt. Substation					X					10,000	

Table 4: Sanpete County

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Critical Facilities											
Centerfield Police Dept Centerfield		X								200	
Ephraim Fire Dept Ephraim	GIS	X								200	
Fairview Fire Dept Fairview		X								100	
Fairview Police Dept Fairview		X								150	
Gunnison Fire Dept		X								200	
Gunnison Police Dept		X								200	
Gunnison Valley Hospital	GIS	X	X			X	X			5,000	
Manti Fire Dept	HAZUS MH	X								200	
Moroni Fire Dept	GIS	X								100	
Moroni Police Dept	HAZUS MH	X								100	
Mt. Pleasant Fire Dept	HAZUS MH	X								100	
Mt. Pleasant Police Dept	GIS	X								100	
Sanpete County Sheriff's Manti	GIS	X								300	
Sanpete Valley Hospital Mt. Pleasant		X	X			X	X			5,000	
Snow College Police Dept. Ephraim		X								100	
Spring City Fire Dept		X								100	
Spring City Police Dept		X								100	
Wales Fire Dept		X								100	
Care Facilities											
Mayfield Community Care Center		X	X				X			150	
Schools											
District Office North Mt. Pleasant		X				X				200	
District Office South Manti		X				X				200	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Fairview School		X	X							200	
Mt. Pleasant School		X	X							200	
Moroni School		X	X							200	
Spring City School		X	X							200	
North Sanpete Middle School Moroni		X								300	
North Sanpete High School Mt. Pleasant		X								500	
Wasatch Academy Mt. Pleasant		X	X							600	
Ephraim School		X	X							200	
Gunnison Valley School		X	X							200	
Manti School		X	X							200	
Ephraim Middle		X								300	
Gunnison Valley High		X								500	
Manti High		X								500	
Snow College Ephraim		X				X				20,000	
Hazardous Material Storage Sites											
Crystal Specialties				X						100	
Mt Pleasant City Corp				X						100	
Draycutt Corp.				X						100	
Moroni Feed				X						500	
AT&T Ephraim				X						200	
Alternater Electric				X						100	
Chevron Manti Bulk Plant				X						100	
Cox Transport				X						200	
Ensign Company				X						100	
Power Substations and Plants											
Moroni Feed Substation					X					10,000	
Moroni Processing Substation					X					10,000	
Mt. Pleasant Substation					X					10,000	
Moroni Substation					X					10,000	
Pine Creek Substation					X					10,000	
Jerusalem Substation					X					10,000	
Fountain Green Substation					X					10,000	
Fountain Green Plant Substation					X					10,000	
Fayette Substation					X					10,000	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Gunnison Substation					X					10,000	
Sanpitch Substation					X					10,000	
Rasmussen Substation					X					10,000	
URCF Substation					X					10,000	
Manti Substation					X					20,000	
Ephraim Substation					X					10,000	
Fairview Substation					X					10,000	
Fairview City Generation Plant					X					10,000	
Companies Employing Greater than 50 People											
Cox Rock Products Centerfield						X				200	
Auto Meter Products Ephraim						X				200	
Ephraim Mini Storage Ephraim						X				150	
Kent's Foods Ephraim						X				150	
Applied Composite Tech Fayette						X				100	
Corrections Dept Gunnison						X				20,000	
Gunnison Thriftway Gunnison						X				150	
Satterwhite Log Homes Gunnison						X				200	
Wasatch Technologies Gunnison						X				200	
Rivers West Apparel Manti						X				100	
Johnson Construction Mount Pleasant						X				150	
Terrel's Thriftway Mount Pleasant						X				200	
Wasatch Academy Mount Pleasant						X				600	
Wind Walker Guest Ranch Spring City						X				200	

Table 5: Sevier County

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Critical Facilities											
Aurora Fire Dept.		X								150	
Elsinore Fire Dept	GIS	X								150	
Koosharem Fire Dept		X								100	
Monroe Fire Dept		X								200	
Richfield Fire Dept		X								250	
Richfield Police Dept		X								200	
Salina Fire Dept	GIS	X								150	
Salina Police Dept	HAZUS MH	X								200	
Sevier County Sheriff's Office	GIS	X								500	
Sevier Valley Hospital	HAZUS MH	X	X			X				20,000	
Sigurd Fire Dept.	HAZUS MH	X								100	
Care Facilities											
Adelaide's House Care Facility Richfield	GIS	X	X							200	
Curtis Residential Care Facility Glenwood	GIS	X	X							200	
Beehive Homes Care Facility Richfield		X	X							200	
Schools											
District Office Richfield		X								300	
Ashman School Richfield		X	X							300	
Koosharem School		X	X							200	
Pahvant School Richfield		X	X							300	
Salina School		X	X							300	
North Sevier Middle Salina		X								500	
South Sevier Middle Monroe		X								500	
Red Hills Middle Richfield		X								500	
North Sevier High Salina		X								1,000	
Richfield High		X								1,000	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
South Sevier High Monroe		X								1,000	
Central Utah Youth Home Richfield		X	X							300	
Strom Ridge Richfield		X	X							200	
Pre-School Richfield		X	X							200	
Hazardous Materials Storage Sites											
U.S. Gypsum										300	
Georgia-Pacific Corp										300	
Hales Sand & Gravel				X						200	
Paragon Industries Inc				X						200	
Wilson Trucking Inc				X						200	
Sevier Valley Tech				X						200	
Wheeler Machinery Co				X						200	
UDOT Materials Lab				X						300	
Jones and DeMille				X						200	
Knight Mine				X						200	
Southern Utah Fuel Company	HAZUS MH			X						200	
Nowers Chevron Station				X						200	
Chevron USA	HAZUS MH			X						200	
DP Curtis Trucking	HAZUS MH			X						200	
BLM Richfield	GIS			X						300	
Power Substations											
Sufco Substation	GIS				X					10,000	
Link Canyon Substation	GIS				X					10,000	
Sigurd Substation	GIS				X					20,000	
Sevier Substation	GIS				X					10,000	
Aurora Substation	GIS				X					10,000	
Salina Substation	GIS				X					10,000	
Garkane Substation	HAZUS HM				X					10,000	
George Pacific Substation	HAZUS HM				X					10,000	
U.S. Gypsum Substation	HAZUS HM				X					10,000	
Moroni Feed Substation					X					10,000	
Richfield Substation					X					20,000	
Central Substation					X					10,000	
Elsinore Substation					X					10,000	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Monroe Substation					X					10,000	
Kimberly SW. RK. Substation					X					10,000	
Freedom Substation					X					10,000	
Winkleman Substation					X					10,000	
Companies Employing Greater than 50 People											
Redmond Minerals Redmond						X				500	
Barney Trucking Salina						X				300	
Georgia Pacific Salina						X				300	
Hales Sand & Gravel Salina						X				200	
Moroni Processing Salina						X				300	
Producers Salina Auction Salina						X				200	
Robinson Transport Salina						X				300	
United States Gypsum Sigurd						X				300	
Adelaide's House Richfield						X				200	
Albertson's Food Richfield						X				300	
Central UT Public Health Richfield						X				200	
DP Curtis Trucking Richfield						X				200	
Diamond C Trailers Richfield						X				200	
JTN Construction Richfield						X				200	
Kmart Richfield						X				500	
Larsen's Ace Hardware Richfield						X				300	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Lin's Marketplace Richfield						X				300	
Richfield Rehab Richfield						X				200	
Sevier County Sheriff's Office Richfield						X				500	
Snow College Maintenance Richfield						X				300	
Sorenson's Ranch School Richfield/Koosharem						X				200	
US Forestry Dept. Richfield						X				300	

Table 6: Wayne County

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Critical Facilities											
Bicknell Fire Dept		X								100	
Hanksville Fire Dept	GIS	X								100	
Loa Fire Dept		X								100	
Lyman Fire Dept		X								100	
Teasdale Fire Dept		X								100	
Wayne County Sheriff's Office		X								150	
Care Facilities											
Beehive Home Care Facility	GIS	X	X							150	
Schools											
District Office	GIS	X								200	
Hanksville School	HAZUS MH	X	X							200	
Loa School	HAZUS MH	X	X							200	
Wayne Middle Bicknell	GIS	X								400	

Name or Description Of Asset	Sources Of Information	Critical Facility	Vulnerable Populations	Hazardous Material Title 3	Infrastructure	Economic Assets	Special Considerations	Historic/Other Considerations	Size of Building (sq. ft.)	Replacement Value in $1,000's (Estimated)	Contents Value *
Wayne High Bicknell		X								600	
Hazardous Materials Storage Sites											
Ron Lewis Construction				X						100	
Power Substations											
Loa Substation					X					10,000	
Companies Employing Greater than 50 People											
Hidden Falls Market & Sinclair Torrey	GIS					X				200	
Aspen Achievement Academy Loa	GIS					X				200	
Wayne County School District Bicknell	HAZUS HM					X				200	

Appendix - C

Natural Hazard Mitigation Strategies

For the purpose of this mitigation plan, mitigation strategies will be divided into one of five categories according to how they accomplish mitigation. The six categories include:

- Emergency Services
- Natural Resource Protection
- Prevention
- Property Protection
- Public Information and Involvement
- Structural Protection

Emergency Service: emergency services protect people during and after a disaster examples include: mutual aid agreements, protection of critical facilities, health and safety maintenances, inventory of assets, and EMS/Police/Fire response and skill.

Natural Resource Protection strategies are strategies, which preserve or restore natural areas or the natural function an area provides this can include: wetlands protection, pollution reduction, erosion and sediment control, fuels reduction, and watershed maintenance.

Prevention: prevention measures are intended to keep the problem from occurring in the first place, and/or keep it from getting worse. Prevention strategies include: primarily planning, zoning, and ordinance issues such as, open space preservation, floodplain and wetland development regulations, storm water management, minimum set back requirements, and evacuation plans.

Property Protection measures are used to modify buildings within high-risk areas in an attempt to reduce damage. Property protection strategies might include: utility relocation, burying or flood proofing, non-structural earthquake mitigation, backup protections, insurance and other financial loss minimization actions, and technical evaluations and mapping. For the most part property protection measures do not affect a buildings appearance of use making them less expensive and particularly suitable for historical sites and landmarks.

Public Information and Involvement activities are intended to advise property owners, potential property owners, and visitors about the particular hazards associated with a property and ways to protect people and property from these hazards. Examples of public information include: NFIP education, providing maps with high hazard locations identified, informational mailings, workshops, real estate disclosures for natural hazards, and education.

Structural Protection/Projects are man made structures, which prevent damage from impacting property. Examples of structural protection include detention/retention basins, larger culverts, elevated seismic design, floodwalls, debris basins, landslide stabilization and levees.

I. Flood/Riverine Mitigation

Generic Mitigation
The following are generic mitigation strategies appropriate for addressing the hazard of flooding. Many of these strategies are expanded upon in the text that follows.

- Avoidance and zoning ordinances.
- Better flood routing through communities.
- Annual warning of risk information on how to protect property and lives.
- Flood insurance awareness, emphasis, and marketing.
- Projects such as levees/dams.
- Funding by a storm water tax in cooperation with Federal and State programs.
- Additional SNOTEL sites and enhanced instrumentation.
- Protection of roads and bridges.
- Greater reservoir capacities.
- Curtail development in flood-prone areas.
- General infrastructure protection.
- Develop river corridor parkways.
- Protection of wastewater treatment facilities from excessive inflows.
- Protection of drinking water supply systems.
- Gather hazard and risk data/information.
- Development of improved mitigation techniques.
- Education of local officials, developers, and citizens.
- Protecting natural floodplain resources.

Emergency Services

Flood Warning
Warning systems designed to alert residence of rising floodwaters. Warning systems can disseminate the information through a number of means such as sirens, radio, television, mobile public address system, reverse 911, or door-to-door contact. Multiple or redundant warning systems are most effective, giving people more than one opportunity to be warned.
Flood Response
Flood response refers to the actions that are taken to prevent or reduce damage once a flood starts, and example of flood response is the turning of State Street into a river during the 1983 flood event. Flood response actions might include:
- Activation of the emergency operations center
- Sandbagging designated areas

- Closing streets and bridges
- Shutting off power to threatened areas
- Releasing children from school
- Ordering an evacuation
- Opening evacuation shelters

Many of these actions should be part of an emergency response plan EOP developed in coordination with the agencies that share responsibilities. The EOP once developed should be exercised and continually evaluated so when the plan is needed key players know what to do.

Critical Facilities Protection

Protecting critical facilities is vital, yet this protection draws workers and resources away from protecting other parts of a town or county. For this reason listed below are vital facilities and facilities with the potential of causing a secondary disaster if destroyed. It is important to keep these locations in mind with considering potential mitigation projects.

Facilities or locations vital to flood response efforts

- Emergency operations centers
- Police and fire stations
- Hospitals
- Highway garages
- Selected roads and bridges
- Evacuation routes

Facilities and locations, which if flooded would create a secondary disaster

- Facilities housing hazardous materials
- Wastewater treatment plants
- Schools
- Nursing homes

The above list of structures is applicable to all disasters.

Health and Safety Maintenance

Response to floods or other natural disasters should include measures to prevent damage to health and safety such as:

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Vaccination residents for tetanus
- Clearing streets
- Cleaning up debris

Many of these recommendations should be integrated into a public information program to educate residence on the benefits of health and safety precautions.

Natural Resource Protection

Wetlands Protection

Wetlands are capable of storing large amounts of floodwater, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies.

Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice, however, since it takes many years for a new wetland to achieve the same level of quality as an existing one.

Erosion and Sedimentation Control

Controlling erosion and sediment runoff during construction and on farmland is important, since eroding soil will typically end up in downstream waterways. Sediment tends to settle where the water flow is slower, it will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters.

Sediment and erosion control have two principal components: minimize erosion with vegetation and capture sediment before it leaves the site. Slowing runoff increases infiltration into the soil, thereby controlling the loss of topsoil from erosion and the resulting sedimentation. Runoff and erosion control can be done through vegetation, terraces, contour strip farming, no-till farm practices, and impoundments.

Prevention Measures

Planning and Zoning

Land use plans are put in place to guide future development, recommending where and where not development should take place. Sensitive and vulnerable lands can be designated for uses that would not be incompatible with occasional flood events. The zoning ordinances can regulate development in these sensitive areas by limiting or preventing some or all development.

Open Space Preservation

Preserving open space is the best way to prevent flooding and flood damage. Open space preservation should not be limited to the flood plain. Other areas within the watershed may contribute to controlling the runoff that exacerbates flooding.

Floodplain Development Regulations

Floodplain development regulations typically do not prohibit development in the special flood hazard areas, but they do impose construction standards on what is built there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential.

Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and/or floodplain ordinances.

Subdivision regulations: these regulations govern how land will be divided into separate lots or sites. In some Utah cities these are known as Site Based Ordinances.

Building Codes: Standards can be incorporated into building codes that address flood proofing from all new and improved or repaired buildings.

Floodplain Ordinances: Communities that participate in the National Flood Insurance Program NFIP are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

Storm Water Management

Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increase storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Most larger cities and counties within Utah enforce an ordinance prohibiting storm water from leaving a site at a rate higher than it did before the development.

Drainage System Maintenance

Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering watercourses or storage basins; regarding and filling should also be regulated.

Property Protection

Relocation

Moving structures out of the floodplain is the surest and safest way to protect against damage. Relocation is expensive, so this approach will probably not be used except in extreme circumstances.

Acquisition

Acquisition by governmental entity of land in a floodplain serves two main purposes: it ensures that the problem structure is addressed; and it has the potential to convert problem areas into community assets

Building Elevation

Elevation a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could by brought in to elevate the site on which the building sits.

Insurance

Above and beyond standard homeowners insurance, there is other coverage a homeowner can purchase to protect against flood hazard. Although this doesn't mitigate the problem it does allow the homeowner to shift the financial loss/risk onto another party. Two of the most common insurances offered against flood loss are:

National Flood Insurance: when a community participates in the NFIP, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.

Basement Backup Insurance: National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet.

Public Information and Involvement

Outreach Programs

Outreach projects are proactive; giving the public information even if they have not asked for it. Outreach projects should be designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples include:

- Mass mailing or newsletters to all residents
- Notices directed to high risk area residents
- Displays in public buildings
- Newspaper articles and special sections
- Radio and TV news releases and interviews
- A detailed property owners handbook tailored for local conditions
- Presentations at meetings and neighborhood groups

Real Estate Disclosure

Disclosure of information regarding flood or hazard prone properties is important if potential buyers are to be in a position to mitigate damage. Federally regulated lending institutions are required to advise applicant that a property is in the floodplain. However, this requirement needs to be met only five days prior to closing, and by that time, the applicant is typically committed to the purchase. This only includes flood prone areas, at the exclusion of other hazards.

Map Information

Flood plain maps developed by FEMA outline the boundaries or the flood hazard areas. These maps can be used by anyone interested in a particular property to determine if it is in the floodplain. These maps are available from FEMA, the Utah Division of Emergency Services, and at many city and county planning offices. In addition the Utah Geologic Survey creates and maintains maps illustrating geologic hazards. These maps are available for sell at the Division of Natural Resources books store.

Structural Projects

The intent behind structural projects for flood mitigation is to prevent floodwaters from reaching properties. The shortcomings of almost all structural mitigation projects are that:

- They can be very expensive
- They disturb the land, disrupt natural water flows, and destroy natural habitats.
- They are built to an anticipated flood event, and my be exceeded by a greater-than-expected flood.
- They can create a false sense of security

Reservoirs
Reservoirs control flooding by holding water behind dams, or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate the river downstream can handle.

Reservoirs are expensive to build, occupy large tracts of land, require maintenance, and if they fail often result in greater down stream flooding than would occur during a natural flooding event.

Levees/Floodwalls
One of the best-known structural flood control measure levees and floodwalls are steel or concrete structures placed between the watercourse and the land.

Diversions
A diversion is simply a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions structures can consist of surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel but during flooding events floodwaters spill over into the diversion channel.

Channel Modifications
Channel modifications include making a channel wider, deeper, smoother, or straighter. Common channel modifications include:

Dredging: Dredging is often cost-prohibitive because the dredged material must be disposed of somewhere else, and dredged streams usually fill back in with sediment.

Drainage Modifications: These include man-made ditches and storm sewers that help drain areas where the surface drainage system is inadequate or where underground drainage ways may be safer or more attractive.

Storm Water Management
Mitigation techniques for managing storm water include installing storm water systems, enlarging pipes, and street improvements in existing storm water systems.

Earthquakes

Generic Mitigation
Below is a list of generic earthquake mitigation strategies pertaining to secondary threats often associated with earthquakes.

Generic Ground Shaking Mitigation
- Understand peak horizontal acceleration and recurrence interval.
- Design appropriately.
- Zoning ordinances and building codes.

Generic Liquefaction Mitigation
- Move soil out.
- Densify soils in place.
- Remove ground water.
- Structural design.

Generic Surface Fault Rupture Mitigation
- Avoidance
- Zoning ordinances
- Earthquake resistant building design codes.
- Retrofitting of critical facilities and supporting equipment.
- Retrofitting under-designed buildings.
- Annual warning of risk/info on how to protect property and lives.
- Projects to seismically upgrade critical public facilities/utilities and shelters.
- Gather hazard and risk data/information.
- Protection of roads and bridges.
- General infrastructure protection.
- Development of improved mitigation techniques.
- Education of local officials, developers, and citizens.

Emergency Service:

Emergency Operations Planning
Maintain an earthquake response plan to account for secondary problems, such as fire and hazardous material spills.

Critical Facilities Protection
Protecting critical facilities is vital as the facilities play an important role in coordinating response and recovery following an earthquake. For this reason listed below are vital facilities and facilities with the potential of causing a secondary disaster if destroyed.

Facilities or locations vital to earthquake response efforts
- Emergency operations centers
- Police and fire stations

- Hospitals
- Highway garages
- Selected roads and bridges
- Evacuation routes

Facilities and locations, which if destroyed would create a secondary disaster
- Facilities housing hazardous materials
- Wastewater treatment plants
- Schools
- Nursing homes

Natural Resource Protection
Design of pipelines.

Prevention:
While earthquakes are not preventable proper planning, zoning, and building codes can prevent much of the damage common with earthquakes. Planning, zoning, and building codes should address minimums setbacks, critical faculty locations, steep slopes, areas with liquefiable soils, and insure high factor of safety ratings for critical facilities.

Property Protection

Nonstructural Mitigation
Nonstructural mitigation consist of mitigative measures that don't affect the overall look or purpose of the building yet prevent damage to no structural aspects and reduce the loss of life. In addition buildings with non-structural mitigation are frequently usable after an event. Examples of nonstructural mitigation include: tie downs, flexible utility connections, Mylar film on windows to prevent the glass from shattering, and added bracing.

Retrofitting
Retrofitting consists of upgrading the seismic safety of a building through structural and nonstructural mitigation techniques.

Insurance:
Above and beyond standard homeowners insurance, there is other coverage a homeowner can purchase to protect against earthquake hazard, something not covered under most homeowners insurance plans. Although this doesn't mitigate the problem it does allow the homeowner to shift the financial loss/risk onto another party.

Public Information and Involvement
Public information and involvement for earthquakes is similar to the mitigation strategies outlined in the flood and riverine section.

Real Estate Disclosure
Disclosure of information regarding earthquakes and hazard prone properties is important if potential buyers are to be in a position to mitigate damage. Unlike floodplains there are no federal laws, which require disclosure of earthquakes.

Structural Protection/Projects

Dam Failure

Generic Mitigation

- Proper mapping of flood plains, including mapping of dam breach flood potential.
- Knowledge must be made public so that emergency managers are aware and the public is aware when they buy and sell property.
- Updated Emergency Action Plans (EAP) and integration with GIS Systems.
- Maintaining proper flood plain and wetland geometry and vegetation will help route floods.
- Flood plain usage should be compatible with flood plain needs.
- More debris dams would help with floods and debris and mud and maintaining a flood control pool in existing dams would be beneficial.
- Protection of roads and bridges.
- General infrastructure protection.
- More authority to order releases and better forecasting would help in snowmelt floods and runoff.
- Gather hazard and risk data/information.
- Development of improved mitigation techniques.
- Education of local officials, developers, and citizens.

Emergency Service:
Dam conditioning monitoring
Warning and evacuation plans based on dam failure

Natural Resource Protection

Prevention:
Dam failure inundation maps
Planning/zoning/open space preservation to keep downs stream areas clear
Building codes with flood elevations based on dam failure
Dam safety inspections
Draining the reservoir when conditions appear unsafe

Property Protection
Acquisition of building in the path of a dam breach flood
Flood insurance

Public Information and Involvement

Structural Protection/Projects
Dam improvements, spillway enlargements
Remove unsafe dams.

Wildfire

Generic Wildfire Mitigation

- Avoidance.
- Define, create, and maintain a defensible space.
- Plant drought and fire resistant vegetation.
- Ordinances.
- Modification of fuel loading in high hazard interface areas.
- Wildland fire training and experience for fire department personnel.
- Public education effort for people living in the interface.
- Additional suppression equipment needs of fire departments and the Utah Division of Forestry, Fire, and State Lands.
- Fuel modification in moderate hazard interface areas.
- Protection of roads and bridges.
- Annual warning of risk/info on how to protect life and property.
- Gather hazard and risk data/information.
- General infrastructure protection.
- Development of improved mitigation techniques.
- Education of local officials, developers, and citizens.
- Protection of drinking water supply systems.

Emergency Service:
Fire fighting

Natural Resource Protection

Prohibit development in high-risk areas.

Prevention:
Zoning ordinances to reflect fire risk zones

Planning and zoning to restrict development in areas near fire protection and water resources

Requiring new subdivisions to space buildings, provide firebreaks, on-site water storage, wide roads and multiple accesses.

Building code standards for roof materials, spark arrestors.

Maintenance programs to clear dead and dry bush trees

Regulations on open fires.

Property Protection
Retrofitting of roofs and adding spark arrestors
Landscaping to keep bushes and trees away from structures
Insurance rates based on distance from fire protection
Public Information and Involvement

Structural Protection/Projects

Landslides

Generic Mitigation

- Avoidance
  - Recognize landslide area
  - Zoning ordinances
- Remove landslide materials
- Drain subsurface materials
- Install surface drains
- Remove materials for the head of the landslide.
- Re-grade.
- Build buttress or retaining wall at the toe of the slope.
- Install soil nails and rock anchors.
- Maintain natural vegetation.
- Improved geologic mapping to identify potential landslide problems.
- Zoning ordinances prohibiting construction in or adjacent to areas with high landslide potential.
- Soil moisture sensors at SNOTEL sites.
- Gather hazard and risk data/information.
- Protection of roads and bridges.
- Development of improved mitigation techniques.
- Education of local officials, developers, and citizens.
- Protection of drinking water supply systems.
-

Generic Rock Fall Mitigation

- Avoidance.
- Stabilize rocks.
- Prerelease.
- Build berms or benches.
- Build structures to stop rocks.

Emergency Service:
Natural Resource Protection

Prevention:
Property Protection

Public Information and Involvement

Structural Protection/Projects

Severe Weather

Emergency Service:
Early warning systems
Natural Resource Protection

Prevention:
Building code standards for light frame construction, especially for wind-resistant roofs.
Property Protection

Public Information and Involvement

Structural Protection/Projects

Problem Soils

Generic Problem Soil Mitigation

- Avoidance.
- Presoak and Compact.
- Remove problem soil.

Landscape so that runoff moves away from foundations.

Emergency Service:
Natural Resource Protection

Prevention:
Property Protection

Public Information and Involvement

Structural Protection/Projects

Drought

Emergency Service:
Natural Resource Protection:

Prevention:

Property Protection:

Public Information and Involvement:

Structural Protection/Projects:

Appendix – D
Environmental Policies

Natural disasters are naturally occurring phenomena. They play an integral part in maintaining balance in our world. Meteorological, geological, or hydrological processes have shaped Utah for millions of years and will continue to shape the valley for millions more years. These unique phenomena only cause disasters when they affect humans and their structure. Modern engineering has made it possible to prevent damage from natural hazards; however the economic and environmental costs can be rather high. Tampering with the natural systems also can create an imbalance in the natural environment. The effects of many of these imbalances are still unknown. It is better to live with a small amount of risk, respect the natural process where appropriate, than to construct mitigation at every chance. Nature provides it's own mitigation measures that need to be identified, protected and/or strengthened. To ensure that our environment is not harmed through mitigation measures all applicable city codes; county codes, state and federal laws pertaining to the environment must be followed. The majority of the proposed mitigation programs in this plan will be funded through federal programs, thus tied to federal funding.

"44 CFR 10.8 (d)(2)(iii) excludes this rule from the preparation of an environmental assessment or environmental impact statement, where the rule relates to actions that qualify for categorical exclusions under 44 CFR 10.8(d)(2)(iii), such as the development of plans under this section" (44 Code).

The following acts will be taken into consideration and will be incorporated when needed while organizing and implementing the PDM plan; Clean Air Act, Clean Water Act, Endangered Species Act, Floodplain Management, National Historic Preservation Act.

Clean Air Act (CAA) 1970: The Clean Air Act is the comprehensive Federal Law that covers the entire country under the Environmental Policy Act (EPA) regulating air emissions from area, stationary, and mobile sources. This law sets limits or National Ambient Air Quality Standards (NAAQS) on how much of a pollutant can be in the air anywhere in the United States, this controls the emissions of air pollutants. These limits ensure that all Americans have the same basic health and environmental protections. Maximum pollutant standards were set and states may have stronger pollution controls on an individual basis, but not weaker pollution controls than those set for the whole country. Each state explains how it will do its job under the Clean Air Act by developing a mandated "state implementation plan" (SIP) that has to be approved by EPA. The 1977 amendment was to set new dates for areas of the country that failed to meet the initial deadlines for achieving NAAQS. The 1990 amendments addressed problems such as acid rain, ground level ozone, stratospheric ozone depletion, and air toxics. This act required that facilities with large amounts of certain hazardous chemicals to have special emergency planning requirement. Based on a facilities potential threat or risk from chemical spills, fires, explosions, etc., a Risk Management Plan (RMP) is prepared that includes hazard identification, assessments, design and maintenance of a safe facility, necessary steps to prevent releases and ways to minimize the consequences from an accidental release (Clean Air).

Clean Water Act (CWA): The Federal Water Pollution Control Act Amendments of 1972 came about because of the growing awareness for controlling water pollution. As amended in 1977, this law became known as the Clean Water Act whose mission is to establish the basic structure for regulating discharges of pollutants into the waters of the United States, and to reduce and maintain the chemical, biological, and physical veracity. The act gave the Environmental Policy Act (EPA) the authority to set wastewater standards for industry. The act also required that each state adopt water quality standards, act to protect wetlands, and limit industrial and municipal discharges into navigable waters unless permitted. It funded the construction of wastewater treatment plants for nearly every city in the United States, and under construction grant programs from the EPA and recognized the need for planning for future problems that posed a threat from non-point source pollution (Clean Water).

Clean Water Act, Section 404-Wetland Preservation: This act regulates activities in wetland areas and authorizes EPA to restrict or prohibit the use of an area as a disposal site for dredged or fill material if the discharge will have unacceptable adverse affects on municipal water supplies, shellfish beds and fishery areas, wildlife and/or recreational areas. A permit must be issued that is based on regulatory guidelines developed in coincidence with the U.S. Army Corps of Engineers and the EPA (CWA Sec. 404).

Endangered Species Act of 1973: This act provides a plan for the protection of threatened and endangered plants and animals and the habitats in which they are found. Congress finds and declares that various species of fish, wildlife, and plants in the United States have been caused to become extinct, or are so depleted in numbers they are in danger of becoming extinct, as a result of economic development and expansion without adequate concern for conservation. Aesthetic, ecological, educational, historical, recreational, and scientific importance come from these species and are a value to our nation and its people. The U.S. will conserve, to a practicable extent, the species that face extinction and will encourage the States through federal assistance to develop and maintain conservation programs. The reason for the Act is to provide a means in which ecosystems with endangered and threatened species will be conserved. It is also declared that all state and local agencies resolve water resource issues in connections with conservation of endangered species (Endangered).

Floodplain Management Policy: The main points of the policy are to reduce the loss of life and property and the disruption of societal and economic pursuits caused by flooding or facility operations as well as to restore, sustain, and enhance the natural resources, ecosystems, and other functions of the floodplains. Activities will search for a balance between the, sometimes competing, uses of floodplains in a way that makes the most benefit to society. To pursue and encourage appropriate use of floodplains and to avoid long and short term negative impacts associated with the inhabitants and modification of floodplains and to avoid direct and indirect support of floodplain development, whenever there is a practicable alternative. “Functions (Natural) of floodplains include natural moderation of floods, fish, wildlife, and plant resources and habitat; groundwater recharge; and water quality maintenance. Uses of floodplains include storm water management; erosion control; open space; natural beauty, opportunity for specific study, outdoor education, recreation, and cultural preservation; and compatible economic utilization of floodplain resources by human society” (Floodplain, Reclamation).

National Historic Preservation Act of 1966: This act was found and declared by Congress because “the spirit and direction of the Nation are founded upon and reflected in its historic heritage…the historical and cultural foundations of the Nation should be preserved as a living part of our community life and development in order to give a sense of orientation to the American people.” Some of the other main points of the act include the awareness of historic properties that are being lost or substantially altered. The preservation will continue a legacy of cultural, educational, aesthetic, inspirational, economic, and energy benefits for future generations. The knowledge of historic resources and “the encouragement of their preservations will improve the planning and execution of Federal and federally assisted projects and will assist economic growth and development. The act would like to use measures that will foster conditions in which historic resources can exist in productive harmony with present and future generations (National).

Section 106 of NHPD “requires all Federal agencies to take into account the effects of their actions on historic properties, and provide ACHP with a reasonable opportunity to comment on those actions and the manner in which Federal agencies are taking historic properties into account in their decisions” beginning at the early stages of planning to mitigate any adverse effects on historic properties (Section 106).

Appendix - E
Richter Magnitude Scale

The Richter Magnitude Scale

Seismic waves are the vibrations from earthquakes that travel through the earth; they are recorded on instruments called seismographs. Seismographs record a zig-zag trace that shows the varying amplitude of ground oscillations beneath the instrument. Sensitive seismographs, which greatly magnify these ground motions, can detect strong earthquakes from sources anywhere in the world. The time, locations, and magnitude of an earthquake can be determined from the data recorded by seismograph stations.

The Richter magnitude scale was developed in 1953 by Charles F. Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquake. On the Richter scale, magnitude is expressed in the whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy that the amount associated with the preceding whole number value.

At first, the Richter Scale could be applied only to the records from instruments of identical manufacture. Now, instruments are carefully calibrated with respect to each other. Thus, magnitude can be computed from the record or any calibrated seismograph.

Earthquakes with magnitude of about 2.0 or less are usually called micro earthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes such as the 1964 Good Friday earthquake in Alaska have magnitudes of 8.0 or higher.
Description of Richter Scale from USGS Earthquake Hazards Program

Modified Mercalli Intensity and PGA Equivalents

MMI	Acceleration (%g) PGA	Perceived Shaking	Potential Damage
I	<0.17	Not Felt	None
II	0.17-1.4	Weak	None
III	0.17-1.4	Weak	None
IV	1.4-3.9	Light	None
V	3.9-9.2	Moderate	Very Light
VI	9.2-18	Strong	Light
VII	18-34	Very Strong	Moderate
VIII	34-65	Severe	Moderate to Heavy
IX	65-124	Violent	Heavy
X	>124	Extreme	Very Heavy
XI	>124	Extreme	Very Heavy
XII	>124	Extreme	Very Heavy

Table expressing relationship of peak horizontal ground acceleration (PGA) to Modified Mercalli Intensity (MMI) adapted after (Wald et al., 1999).

Appendix F

North Sanpete County Regional Fire Plan

for the Wildland / Urban Interface

Protecting Life, Property, and
Community Values
through
Community-Based Planning

Prepared by: North Sanpete Fire Council
Date Prepared: September 16, 2003

INSTRUCTIONS

Declaration and Concurrence Page

This list needs to be customized to the individual plan. Provide the names and affiliations of all fire partners. This page will then be signed after all fire partners have reviewed the plan and concur with its contents. An Area Manager or Fire Management Officer from the Utah Division of Forestry, Fire and State Lands must be included.

Blake Ince, Blackhawk Mountain Estates Property Owners Association	Date
Donna Pendrey, Homeowners Association President	Date
Chuck Cummins, Indian Ridge Property Owners Association	Date
Jay Barlow, Indian Ridge Property Developer	Date
Jeff Cox, Fairview Volunteer Fire Department	Date
Fred Johnson, Sanpete County Fire Warden	Date
Claudia Jarrett, Sanpete County Commission	Date
Emery Polelonema, Six County Association of Governments	Date
Kevin G. Holman, Deputy County Sheriff, County Emergency Manager	Date
Kelly Allen, State of Utah, DNR, Div of Forestry, Fire & State Lands – Area Manager	Date
Lito Contreras, USDA Forest Service – Manti LaSal National Forest	Date
Robert Beal, Scout Master, Boy Scouts of America	Date

PART I
COMMUNITY DESCRIPTION

***Directions**: <u>This section is to be completed by the Community Wildfire Committee</u>. A community description identifies community resources that can be used to complete the goals of the plan as well as a physical description of the community that can help impact wildfire preparation and response decisions.*

INSTRUCTIONS

1. Planning Committee Members List

List the names, affiliations and phone numbers of the planning committee members, i.e. residents, council members, sheriff, etc.

Name	Affiliation	Phone Number	E-mail
John & Donna Pendrey	Hideaway Valley Homeowners Association	(435) 427-3264	
Theo & EdaBee Anderson	Resident	(435) 427-3588	theo@cut.net
Carl & Beverly Winters	Hideaway Valley Homeowners Association	(435) 427-3399	winters@cut.net
Spencer Shields	Resident	(435) 427-9316	
Bryan Ady	Resident	(435) 427-3383	ady@cut.net
Tom & Graciela Meyers	Resident	(435) 427-9802	102211.240@compuserve.com
Charles Brown	Resident	(435) 427-3289	
Jay Barlow	Resident	(435) 427-9303	
Ricky Butrum	Resident	(435) 427-9581	
Annette Grant	Resident	(435) 427-9518	
Randall & Bambi Elliott	Resident	(435) 427-3739	bce_1959@yahoo.com
McKay & Janae Larsen	Resident	(435) 427-3590	
Mitchell Loomis	Resident	(435) 427-9817	
Phil Alexander	Resident	(435) 427-9266	
Milton Rich	Resident	(435) 427-3634	
Clyde Holm	Resident	(435) 427-3574	
Dave Tanner	Resident	(435) 427-3627, (801) 465-4568	
Fred Johnson	Sanpete County Fire Warden	(435) 835-2117, (435) 851-1546	fredjohnson@utah.gov
Kevin Holman	Sanpete County Sheriff's Office	(435) 835-2191	holmank@sanpeteso.org
Keith Crumpton	Resident	(435) 427-9837, (801) 231-1933	
Charles Jeffs	Resident	(435) 283-4379, (435) 851-0095	
Chuck Cummins	Indian Ridge Property Owners Association	(801) 787-8444	
Dave Tanner	Resident	(435) 427-3627, (801) 465-4568	
Foulke, Glen & Linda	Resident	801-794-0399	

INSTRUCTIONS

2. Community Legal Structure

List the government entities associated with the community – city, town, unincorporated, special service district, homeowner association(s), other. Part of the purpose in this exercise is to help identify organizations through which grant funding – federal, state, or other - can be channeled.

Organization	Contact Person	Phone Number	E-mail
Sanpete County Commission	Commissioner Bruce Blackham, Chair	(435) 835-2141, cell (435) 851-1549	blackham@sanpetecounty-ut.gov
	Commissioner Greg Dettinger	cell (435) 851-1547	greg@sanpetecounty-ut.gov
	Commissioner Claudia Jarrett (Fire District and Forest Service Liaison)	(435) 283-7058, cell (435) 851-1540	jarrett@sanpetecounty-ut.gov, claudia.jarrett@snow.edu
Hideaway Valley Property Owners Association	Donna Pendrey, President	(435) 427-3264	
Fairview Volunteer Fire Department	Jeff Cox	(435) 835-2191 (dispatch), or Jeff Cox (435) 427-3535	TBD
State of Utah, Division of Forestry, Fire, and State Lands	Scott Zeidler	(801) 538-7487	scottzeidler@utah.gov
Sanpete County Sheriff's Office	Kevin Holman	(435) 835-2191	holmank@sanpeteso.org
Six County Association of Governments	Emery Polelonema	(435) 896-9222, x25	epolelon@sixaog.state.ut.us
	Edwin Benson	(435) 896-9222, x18	ebenson@sixaog.state.ut.us
Rotary Club	TBD	TBD	TBD
Chamber of Commrce	TBD	TBD	TBD
Sanpete Search & Rescue	TBD	TBD	TBD
Red Cross	TBD	TBD	TBD

INSTRUCTIONS

3. Population

Provide information regarding the population of the area, including:

Approximate full-time	Approximate number of lots	Approx. number of commercial entities
Approximate part-time	Approximate number of homes	Approx. visitor population during fire season

Total number of lots: 1959 lots Source: Sanpete County Recorder
Total number of homes: 331 (estimate)

Full-time residences:	115
Full-time residents:	380 persons (year-around residents, adults and children) (Note: Full-time residences are occupied by an average of 3.3 persons.)
Part-time residents:	673 persons (estimated 204 part-time residences times 3.3 persons per residence)
Seasonal residents:	1000+ (seasonal residents, adults and children)
Visitor population:	Through-traffic of around 1,000 to 2,000 people per day during fire season
Commercial entities:	5

Description	Hideaway Valley	Blackhawk Estates	Indian Ridge	Panorama Woods	Fairview Ranchos	Indianola
Total number of lots	448	449	740	242	48	32
Total number of homes/cabins	130 est	16	50 est	75 est	30 est	30 est
Full-time residences	64	7	2	TBD	20	22
Full-time residents	198	26	4	25 est	64	63
Part-time residences	65 est	9	50 est	70 est	5 est	5 est
Visitor population	See est.	See est.	See est.	See est.	See est.	See est.
Commercial entities	2	0	0	0	2	1

INSTRUCTIONS

4. Estimated Values at Risk

Provide an approximation of the estimated current values of residential and commercial property in the subdivision. The County Assessor should be able to assist with this information.

The estimated values at risk of residential and commercial property in the year 2003 are approximately $48,400,000.

These estimates are based on calculations that assume (1) each home is valued at $200,000, (2) each cabin is valued at $100,000, and (3) each business is valued at $1,000,000. (Note: The County Assessor declined to answer the request for information. Estimation of values at risk is planned as part of this Community Fire Plan.)

Subdivision Name	Estimated values at risk of residential and commercial property in the year 2003.
Hideaway Valley	$21,300,000
Blackhawk Estates	$ 2,300,000
Indian Ridge	$ 5,400,000
Panorama Woods	$ 7,000,000
Fairview Ranchos	$ 6,500,000
Indianola	$ 5,900,000

INSTRUCTIONS

5. Natural Resources at Risk

Describe the natural resources at risk in the subdivision and surrounding area.

The North Sanpete communities border on National Forest lands. The recreation areas of Skyline Drive are immediately east of the communities. The National Forest lands include timber, watershed, wildlife, and recreational resources. The communities themselves include agricultural resources.

INSTRUCTIONS

6. Commercial Entities

List contact information for commercial entities in the area (not just in the subdivision).

Organization	Contact Person	Phone Number / E-mail	Address
(6) Questar Gas (pipeline)	TBD	800-541-2824 to report breaks, leaks, or odors.	2100 S Industrial Park Rd., Richfield, UT 84701
Central Utah Telephone	Eddie Cox	435-427-3331 / ecox@cut.net 435-427-3809 fax	45 W Center Fairview, UT 84629
Utah Power	Mark Cox	mark.cox@pacificorp.com	
Walker's Gas and Groceries		435-427-9304	336 N State Fairview, UT 84629
Fred and Audrey's Gas and Groceries	TBD	TBD	TBD
Far West Bank	TBD	435-427-3361	320 N Milburn Rd. Fairview, UT 84629
Big Pine Sports	TBD	435-427-3338	340 N Milburn Rd Fairview, UT 84629
Cox Automotive	Ron Cox	435-427-9241	255 E Canyon Rd Fairview, UT 84629
MJK Construction	TBD	435-427-9299	47 W Center Fairview, UT 84629
Christiansen Brothers Rock Products	Brent Christiansen	435-462-9166	PO Box 191 Fairview, UT 84629
(5) Noorlander Building & Roofing, Inc.	James Noorlander	435-427-3711	HC 13 Box 4314 Fairview, UT 84629
(1) Bryan Ady Excavating	Bryan Ady	435-427-3383	HC 13 Box 300-12 Fairview, UT 84629
Fairview Drilling & Pump Service	Roger Paulsen	435-427-3421	131 N. 200 E. PO Box 289 Fairview, UT 84629
(1) CC Horses & Tack	TBD	TBD	HC 13 Box 300-25 Fairview, UT 84629
(5) Troy Young's Awnings	Troy Young	435-427-3412	34780 N. 7900 E.

			HC 13 Box 4409 Fairview, UT 84629
Johansen Sand & Gravel	TBD	435-462-9426, 435-462-2487	TBD

Located in the (1) Hideaway Valley, (2) Blackhawk Estates, (3) Indian Ridge, (4) Panorama Woods, (5)Fairview Ranchos, or (6) Indianola..

INSTRUCTIONS

7. Formal Associations

List contact information for civic groups, churches, volunteer organizations, etc.

Organization	Contact Person	Phone Number	E-mail
LDS Church	Carl Winters	(435) 427-3399	winters@cut.net
Boy Scout Troop 1660	Robert Beal	(435) 427-3719	
Cub Scout Troop 1660	Robert Beal	(435) 427-3719	

INSTRUCTIONS

8. Media Support

List contact information for local media, such as newspapers, newsletters, websites, etc.

Organization	Contact Person	Phone number	E-mail
KMTI Radio – Manti, Utah		435-835-7301	
Pyramid Newspaper (weekly)		435-462-2134	pyramid@avpro.com
Messenger Newspaper (weekly)		435-835-4241	dcall@manti.com
Horseshoe Trader (weekly)		435-835-6272	
Provo Daily Herald (daily)			

INSTRUCTIONS

9. Schools

List contact information for all public and private schools in the community.

Organization	Contact Person	Phone; E-mail	Address
Fairview Grade School		(435) 427-9204	11200 E. 24500 N. Fairview, UT 84629
North Sanpete High School		(435) 462-2452	390 E. 700 S. Mt. Pleasant, UT 84647
Wasatch Academy		(435) 462-2411	120 S. 100 W. Mt. Pleasant, UT 84647
Snow College		(435) 283-7000	150 E. College Avenue Ephraim, UT 84627

INSTRUCTIONS

10. Transportation

List contact information for any railroad, highway, or other public transportation routes or means in the community.

Organization	Contact Person	Phone Number	E-mail
Sanpete County Road Department	Steve Keller	(435) 835-6441	None
Utah Dept. of Transportation (Shed 4334)	TBD	(435) 462-2272	TBD

INSTRUCTIONS

11. Private Emergency Services and Equipment

List privately-owned equipment and services available for wildfire response, with contact information. If such services or equipment are already contracted under the County Mobilization Plan, they should not be listed here.

Type of Equipment	Contact Person	Phone; E-mail	Address
Back Hoe, Bulldozer, Track Hoe	Bryan Ady	(435) 427-3383; ady@cut.net	HC-13 Box 300-12, Fairview, UT 84629
Back Hoe, Bobcat	Terrell Pack	(435) 427-3340	Fairview, UT 84629
Bulldozer, Back Hoe, Road Grader	Jay Barlow	(435) 427-9303	HC-13 Box 4231, Fairview, UT 84629

INSTRUCTIONS

12. Restricting covenants, ordinances, etc.

Describe any pertinent restricting covenants, ordinances, etc., concerning wildfire in the community. For example, requirements regarding gated communities, building construction materials, vegetation removal.

The following restrictions need to be considered in any fuel management or fire protection projects:

Homeowner Association Bylaws, where they exist, are generally regarded as not negatively impacting wildfire mitigation efforts in the community, e.g., none of the communities are gated. Evaluation of Homeowner Association Bylaws is planned as part of this Community Fire Plan.

INSTRUCTIONS

13. Insurance Rating

Provide the current insurance rating for the community. (The community's primary fire protection provider should be able to assist with this information.)

Fire Insurance Rating: The north Sanpete County area generally carries a fire insurance rating of Class 9.

INSTRUCTIONS

14. PHYSICAL DESCRIPTION

While completing the following assessments of the community, consider the height, width, weight, and turnaround needs of emergency equipment. Exact clearance requirements may vary by community.

Road clearance height ≥ 13'6" Dead end street turnaround ≥ 100' diameter
Road clearance width ≥ 20' Bridge/culvert weight limit = 20 tons per axle

Driveway clearance height ≥ 13'6" Driveway turnarounds* ≥ 30' (inside turning radii), 45' (outside turning radii)
Driveway clearance width ≥ 12' Driveway turnouts** ≥ 10' wide and 30' long
* for driveways in excess of 150' in length
** for driveways in excess of 200' in length and less than 20' in width

If desired, section 14 (pages 10 - 12) can be copied, completed, and included in the community fire plan.

INSTRUCTIONS

A. Access

Provide detailed information regarding access to the community, including all-weather and seasonal access.

(1) Hideaway Valley,

i. Directions to community:
From Fairview, go north on State Highway 89 for 9 miles. Turn east on Hideaway Valley Road (poorly marked) for 0.9 miles. Turn north and enter the Hideaway Valley subdivision.
From Fairview Volunteer Fire Department, go north on State Highway 89 for 9 miles. Turn east on Hideaway Valley Road (poorly marked) for 0.9 miles. Turn north and enter the Hideaway Valley subdivision.

ii. All-weather access: Yes, to signs indicating the limit of snow removal. (4-wheel drive may be required to some properties.)

iii. Seasonal access: Yes, to signs indicating the limit of snow removal. (4-wheel drive may be required to some properties. Some properties inaccessible in winter.)

(2) Blackhawk Estates,

i. Directions to community:

From Fairview, go north on State Highway 89 for 9 miles. Turn east on Hideaway Valley Road (poorly marked) for 0.9 miles. Continue east and enter the Hideaway Valley subdivision.
From Fairview Volunteer Fire Department, go north on State Highway 89 for 9 miles. Turn east on Hideaway Valley Road (poorly marked) for 0.9 miles. Continue east and enter the Hideaway Valley subdivision.

ii. All-weather access: Yes. (4-wheel drive may be required to some properties.)
iii. Seasonal access: Yes, volunteer snow removal. (4-wheel drive may be required to some properties. Some properties inaccessible in winter.)

(3) Indian Ridge,

i. Directions to community:
From Fairview, go north on State Highway 89 for 9 miles. Turn west on Big Hollow Road (poorly marked) and enter the Indian Ridge subdivision.
From Fairview Volunteer Fire Department, go north on State Highway 89 for 9 miles. Turn west on Big Hollow Road (poorly marked) and enter the Indian Ridge subdivision.
ii. All-weather access: Yes. (4-wheel drive may be required to some properties.)
iii. Seasonal access: Yes. (4-wheel drive may be required to some properties. Some properties inaccessible in winter.)

(4) Panorama Woods,

i. Directions to community:
From Fairview, go north on State Highway 89 for 10 miles. Turn east on Indianola Road (poorly marked) and proceed 3 miles to enter the Panorama Woods subdivision.
From Fairview Volunteer Fire Department, go north on State Highway 89 for 10 miles. Turn east on Indianola Road (poorly marked) and proceed 3 miles to enter the Panorama Woods subdivision.
ii. All-weather access: No. (4-wheel drive may be required to some properties. Some properties inaccessible in inclement weather and in snow.)
iii. Seasonal access: Yes. (4-wheel drive may be required to some properties. Some properties inaccessible in inclement weather.)

(5) Arrowhead Estates,

i. Directions to community:
From Fairview, go north on State Highway 89 for 10 miles. Turn east on Indianola Road (poorly marked) and proceed 5 miles to enter the Arrowhead subdivision.
From Fairview Volunteer Fire Department, go north on State Highway 89 for 10 miles. Turn east on Indianola Road (poorly marked) and proceed 5 miles to enter the Arrowhead subdivision.
ii. All-weather access: No. (4-wheel drive may be required to some properties. Some properties inaccessible in inclement weather and in snow.)
iii. Seasonal access: Yes. (4-wheel drive may be required to some properties. Some properties inaccessible in inclement weather.)

(6) Fairview Ranchos I, II, and III,

i. Directions to community:
From Fairview, go north on State Highway 89 for 10 miles. Turn west on Road (poorly marked) and enter the Fairview Ranchos subdivision.
From Fairview Volunteer Fire Department, go north on State Highway 89 for 10 miles. Turn west on Road (poorly marked) and enter the Fairview Ranchos subdivision.
ii. All-weather access: Yes. (4-wheel drive may be required to some properties.)
iii. Seasonal access: Yes. (4-wheel drive may be required to some properties.)

(7) Indianola,

i. Directions to community:

From Fairview, go north on State Highway 89 for 10 miles. Turn east on Indianola Road (poorly marked) and enter the Indianola subdivision.
From Fairview Volunteer Fire Department, go north on State Highway 89 for 10 miles. Turn east on Indianola Road (poorly marked) and enter the Indianola subdivision.

ii. All-weather access: Yes.
iii. Seasonal access: Yes.

(8) Milburn,

i. Directions to community:
From Fairview, go north on Milburn Road for 6 miles.
From Fairview Volunteer Fire Department, go north on Milburn Road for 6 miles.
ii. All-weather access: Yes.
iii. Seasonal access: Yes.

INSTRUCTIONS

B. Roads

Provide information regarding the condition and types of roads in the community. Percentages are ideal, but general estimations are sufficient.

i. Few road signs are present.

ii. 20% are pavement; 65% are gravel; 15 % are dirt

iii. Most will support 2 lanes of traffic. Numerous 1 lane roads in the area.

iv. Some are loop roads.

iv. Some are dead-end roads. Of these, most have inadequate turnaround space available at the end of the road for emergency equipment (based on turning radius listed in front of this section).

INSTRUCTIONS

C. Driveways

Provide a general assessment of the driveways in the community, in regard to emergency equipment (based on height and width information listed in front of this section) and emergency response.

i. Most driveways width and height clearance, road grades and vegetation appearance are adequate for emergency equipment.

ii. Few individual homeowners have posted their name and address. (Note: Most homes have “county” or “rural” addresses which do not adequately provide “directions” to properties.)

INSTRUCTIONS

D. Structures

Assess the community in regard to building structures and wildfire hazard – construction materials, visibility, etc. Percentages are ideal, but general estimations are sufficient.

i. Most are of wood-frame construction.
ii. Most have wood decks or porches.
iii. Most have wood shake or shingle roofs.
iv. Few are visible from the main subdivision road.

INSTRUCTIONS

E. Bridges, Gates, Culverts, other

Assess the community's infrastructure for potential obstacles to emergency response. Consider weight, height, and width information of emergency vehicles as listed in front of this section.

i. All bridges support emergency equipment.
ii. All gates provide easy access to emergency equipment.
iii. Some culverts are easily crossed by emergency equipment.

INSTRUCTIONS

F. Utilities

Assess and provide information on the utilities serving the community, in regard to wildfire hazard and emergency response capabilities.

i. Telephone service is below ground.

Provided by: Central Utah Telephone Telephone #: (435) 427-3331

ii. Electrical service is both above and below ground.

Provided by: Utah Power Telephone #: (877) 548-3768, (888) 221-7070

iii. Are there homes / structures utilizing propane? Yes

If yes: 95 % of those propane tanks are above ground

If some are above ground: None are marked with a flag or by other highly visible means

List locations of those propane tanks above ground. Development of a list of above-ground propane tanks is planned as part of this Community Fire Plan.

iv. Are there homes / structures utilizing natural gas? Yes

v. Primary water sources:

Approximately 5 % of homes use central water system.

Approximately 90 % of homes use individual wells.

Approximately 5 % of homes have additional private water source.

Water provided by: Indian Ridge Water Conservancy District Telephone #: (435) 427-9303

PART II:
COMMUNITY PRESCRIPTION

***Directions**: This section is to be completed by the Community Wildfire Committee. A community prescription includes the goals of the plan, identifies specific actions needed to complete the goals of the wildfire plan and identifies responsible parties, resources and priorities.*

INSTRUCTIONS

1. Goals of Plan

Provide a brief statement of the goals of the Community Wildfire Plan. **Each plan must address the following: Fuel Reduction, Facilities and Equipment, Education, Emergency Response Plan (including comprehensive plans for shelter-in-place and evacuation), Regulative Issues, and Evaluation and Maintenance.**

1 . GOALS/PURPOSE OF PLAN

A. Increase public awareness of the risks posed by wildfire to life safety and property of area residents through implementation of a wildfire hazard education program.
B. Increase life safety and enhance forest health through the implementation of a survivable space program. Objective is to achieve 75% of the homes within the project area within a 5 year period.
C. Develop and implement hazardous fuels mitigation program to establish fuel breaks where needed and to reduce hazardous fuel concentrations within and surrounding our area.
D. Establish a fire safe road program.
E. Increase water supplies for fire suppression needs.
F. Establish perimeter fuel breaks to increase public safety.
G. Evaluate, upgrade, and maintain community wildfire response facilities, equipment, and training.
H. Develop and implement a comprehensive emergency response plan.
I. Address regulatory issues impacting community wildfire prevention and response needs.

INSTRUCTIONS

2. Identification of Actions

Describe projects that need to be done to complete the goals of the plan, and to perform annual and periodic maintenance of the plan.

GOAL: A. Increase public awareness of the risks posed by wildfire to life safety and property of area residents through implementation of a wildfire hazard education program.

ACTION 1: Implement a wildfire safety education program within the project area.

ACTION 2: Plan and implement an annual wildfire awareness day within the project area.

ACTION 3: Identify sources of fire safety information.

ACTION 4: Obtain pamphlets, maps, and other information; and arrange for distribution.

ACTION 5: Develop mailing list of landowners in the area, including telephone contact information, wherever permission can be secured from the landowner to disclose the information.

ACTION 6: Distribute periodic newsletter with pertinent fire safety information.

ACTION 7: Establish notice boards where pertinent information can be posted for general public view.

ACTION 8: Work with partners to determine needs and establish a model site(s), model planting(s), or other model resource(s) to demonstrate and/or show community members what can be done.

GOAL: B. Increase life safety and enhance forest health through the implementation of a survivable space program. Objective is to achieve 75% of the homes within the project area within a 5 year period.

ACTION 1: Coordinate and implement a wildfire lot assessment program within the project area.

ACTION 2: Implement a survivable space program within the project area.

GOAL: C. Develop and implement hazardous fuels mitigation program to establish fuel breaks and/or other mitigation treatments where needed to reduce hazardous fuel concentrations within and surrounding our area.

ACTION 1: Implement a wildfire safety education program within the project area.

ACTION 2: Coordinate an annual brush/fuel removal activity within the project area.

ACTION 3: Identify and develop brush/slash fuels disposal area with convenient access to landowners and make them fire safe. Clearly designated areas for culled vegetation. Provide aid to the Fuel Reduction Committee in making disposal areas safe.

ACTION 4: Obtain use of a chipper for the general area.

ACTION 5: Encourage marking of propane and gas storage areas.

GOAL: D. Establish a fire safe road program.

ACTION 1: Coordinate an annual wildfire safety awareness day within the project area.

ACTION 2: Identify roads that do not meet existing fire codes (UFC) for such items as dead end roads, inadequate turn-arounds, over hanging vegetation, etc.

ACTION 3: Coordinate with Property Owners Associations, developers and county officials to conduct fuel clearance activities.

ACTION 4: Identify inadequate turnabouts and explore ways and means to enlarge them to appropriate size.

ACTION 5: Establish adequate turn abouts for emergency equipment.

ACTION 6: Implement a street and road marking program to aid emergency services personnel.

ACTION 7: Develop an accurate map of project area identifying structures and resources useful to fire suppression and emergency response responders.

ACTION 8: Provide updated maps of the area to emergency response groups annually.

ACTION 9: Encourage county officials to complete E911 for the area.

ACTION 10: Develop general evacuation strategies and distribute to landowners.

ACTION 11: Work with local church groups and Red Cross as to needs in case of catastrophic fire.

ACTION 12: Work with fuel reduction committee to have safe areas located throughout area where people could migrate in event of catastrophic fire.

ACTION 13: Work with partners to get GPS maps and/or other mapping resources available for community use and/or for developing updated maps.

GOAL: E. Increase water supplies for fire suppression needs.

ACTION 1: Evaluate possible sources of water, including developing pond(s) or developing well(s).

ACTION 2: Work with state water resources to develop water rights to support water supplies for fire suppression.

GOAL: F. Establish perimeter fuel breaks to increase public safety**.**

ACTION 1: Implement a fuel break program within the project area.

ACTION 2: Work with appropriate partners (private, state, federal) on the best location for fuel breaks and implement the establishment of fuel breaks.

ACTION 3: Once established, implement maintenance of fuel breaks.

GOAL: G. Evaluate, upgrade, and maintain community wildfire response facilities, equipment, and training.

ACTION 1: Work with appropriate partners to determine equipment, facility, and training needs.

ACTION 2: Work with appropriate partners to develop fire suppression strategies and train personnel.

ACTION 3: Work with appropriate partners to train personnel for Community Emergency Response Team (CERT).

ACTION 4: Work with appropriate partners to train personnel for appropriate levels of fire awareness and fire-fighting skills.

ACTION 5: Work with appropriate partners to train personnel for appropriate levels of first aid or emergency medical (EMT) skills.

ACTION 6: Identify existing equipment, personnel, and external resources.

GOAL: H. Develop and implement a comprehensive emergency response plan.

ACTION 1: Develop an emergency notification system.

ACTION 2: Develop an emergency action plan.

ACTION 3: Develop an emergency shelter-in-place plan.

ACTION 4: Develop secondary escape routes.

ACTION 5: Work with appropriate partners to secure cellular telephone service for the area to support emergency communication requirements.

ACTION 6: Work with appropriate partners to evaluate and secure suitable redundant and fail-safe communications technology (radio communications, UDOT Emergency Radio Transmitter, local sirens, in-home radio receivers, etc.) for the area to support emergency communication requirements.

GOAL: I. Address regulatory issues impacting community wildfire prevention and response needs.

ACTION 1: Identify rules that impact wildfire preparation and response and make recommendations for improvement.

ACTION 2: Evaluate feasibility of using non-profit status structure for homeowners association(s) or partnership with a non-profit organization(s).

INSTRUCTIONS

3. Identification of Responsible Parties, Resources and Priorities

Outline how the actions described in Item 2 will be accomplished, by listing responsible parties (person who is responsible for each action), resources (assets needed to complete actions), and priorities (designating of each action as high, medium or low priority).

Accomplishment of specific actions targeted against specific goals must be managed through the careful orchestration of the available community resources. To accomplish this, the community will convene committees to focus on major subdivisions of activities, committees may include, but are not limited to:

- North Sanpete Fire Council, the overall advisory body

NSFC Supporting Committees:

  - Fuel Reduction Committee, the advisory body coordinating fuel reduction/mitigation activities
  - Awareness, Education, and Training Committee, the advisory body coordinating the educational effort
  - Demonstration Projects Committee, the advisory body coordinating demonstration activities
  - Communication and Signage Committee, the advisory body coordinating communications and signs

- Annual Cleanup Committee, the advisory committee coordinating the annual/semi-annual cleanups
- Public Relations Committee, the advisory committee coordinating sharing our successes and searching for new resources
- Technical Committee, the advisory body coordinating assessment activities
- Accountability and Records Committee, the advisory body coordinating accounting of community labor, materials, and equipment usage.

The committees will work with the partners and resources identified, or that may be identified in the future. Partners and resources include, but are not limited to:

- Property Owners
- Property Owners Associations
- Builders and Developers
- State of Utah, DNR, Div of Forestry, Fire & State Lands
- Forest Service
- Sheriff's Department
- Fairview Volunteer Fire Department
- Fairview Police Department
- Sanpete County Commissioner
- Six County Association of Governments
- Questar Gas
- Utah Power
- Central Utah Telephone
- KMTI Radio
- Local Publications: Pyramid, Horseshoe Trader, Messenger
- Local Businesses
- Utah State University
- Snow College
- Local Churches
- FireWise
- Living With Fire
- American Red Cross
- Boy Scouts of America

The Goals and Actions in this plan are managed in accordance with the following table:

Aim	Action	Resources	Responsible Party	Priority

North Sanpete County Regional Fire Plan				
GOAL: A. Increase public awareness of the risks posed by wildfire to life safety and property of area residents through implementation of a wildfire hazard education program.	ACTION 1: Implement a wildfire safety education program within the project area.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • Forest Service • Sheriff's Department • Snow College • KMTI Radio • NSFC Supporting Committees	Responsible Committee: North Sanpete Fire Council, Responsible Person: Chair	High
	ACTION 2: Plan and implement an annual wildfire awareness day within the project area.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • KMTI Radio • NSFC Supporting Committees	Responsible Committee: Public Relations Committee, Responsible Person: Chair	Medium

	ACTION 3: Identify sources of fire safety information.	• Property Owners Associations • Property owners • FireWise • Living With Fire • Six County Association of Governments • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Utah State University • Department of the Interior - Bureau of Land Management • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee, Responsible Person: Chair	Medium
	ACTION 4: Obtain pamphlets, maps, and other information; and arrange for distribution.	• FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Utah State University • Department of the Interior - Bureau of Land Management • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee Responsible Person: Chair	Medium
	ACTION 5: Develop mailing list of landowners in the area, including telephone contact information, wherever permission can be secured from the landowner to disclose the information.	• Property Owners Associations • Property Owners • Local Churches • Central Utah Telephone • Sanpete County Recorder • NSFC Supporting Committees	Responsible Committee: Public Relations Committee Responsible Person: Chair	Low

	ACTION 6: Distribute periodic newsletter with pertinent fire safety information.	• Property Owners Associations • Property Owners • Local Churches • Boy Scouts of America • KMTI Radio • Pyramid • Horseshoe Trader • Messenger • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee, Responsible Person: Chair	Low
	ACTION 7: Establish notice boards where pertinent information can be posted for general public view.	• Property Owners Associations • Property Owners • Sheriff's Department • Local Businesses • Boy Scouts of America • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	Medium
	ACTION 8: Work with partners to determine needs and establish model site(s), model planting(s), or other model resource(s) to demonstrate and/or show community members what can be done to improve potentially survivable space.	• Property Owners Associations • Property Owners • Local Churches • USDA Forest Service • Utah State University • Snow College • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • Boy Scouts of America • KMTI Radio • NSFC Supporting Committees	Responsible Committee: Demonstration Projects Committee Responsible Person: Chair	Medium
GOAL: B. Increase life safety and enhance forest health through the implementation of a survivable space program. Objective is to achieve 75% of	ACTION 1: Coordinate and implement a wildfire lot assessment program within the project area.	• Property Owners Associations • Property Owners • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire	Responsible Committee: Technical Committee Responsible Person: Chair	High

the homes within the project area within a 5 year period.		Department • NSFC Supporting Committees		
	ACTION 2: Implement a survivable space program within the project area.	• Property Owners Associations • Property Owners • Local Churches • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • NSFC Supporting Committees	Responsible Committee: Fuel Reduction Committee Responsible Person: Chair	High
GOAL: C. Develop and implement hazardous fuels mitigation program to establish fuel breaks and/or other mitigation treatments where needed to reduce hazardous fuel concentrations within and surrounding our area.	ACTION 1: Implement a wildfire safety education program within the project area.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • Forest Service • Sheriff's Department • Snow College • KMTI Radio • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee Responsible Person: Chair	High

	ACTION 2: Coordinate an annual brush/fuel removal activity within the project area.	• Property Owners Associations • Property Owners • Local Churches • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • Boy Scouts of America • KMTI Radio • NSFC Supporting Committees	Responsible Committee: Fuel Reduction Committee Responsible Person: Chair	High
	ACTION 3: Identify and develop brush/slash fuels disposal area with convenient access to landowners and make them fire safe. Clear designated areas for culled vegetation. Provide aid to the Fuel Reduction Committee in making disposal areas safe.	• Property Owners Associations • Property Owners • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • County Government • NSFC Supporting Committees	Responsible Committee: Annual Cleanup Committee Responsible Person: Chair	Medium
	ACTION 4: Obtain use of a mobile chipper or chipper services for the general area.	• Property Owners Associations • Property Owners • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • County Government • NSFC Supporting Committees	Responsible Committee: Annual Cleanup Committee Responsible Person: Chair	Medium

	ACTION 5: Encourage marking of propane and gas storage areas.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • County Government • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	High
GOAL: D. Establish a fire safe road program.	ACTION 1: Coordinate an annual wildfire safety awareness day within the project area.	• Property Owners Associations • Property Owners • Local Churches • Neighboring Property Owners Associations • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee Responsible Person: Chair	Medium
	ACTION 2: Identify roads that do not meet existing fire codes (UFC) for such items as dead end roads, inadequate turn-arounds, over hanging vegetation, etc.	• Property Owners Associations • Property Owners • Neighboring Property Owners Association • FireWise • Living With Fire • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • County Road Department • NSFC Supporting Committees	Responsible Committee: Technical Committee Responsible Person: Chair	High

	ACTION 3: Coordinate with Property Owners Associations, developers and county officials to conduct fuel clearance activities.	• Property Owners Associations • Property Owners • Local Churches • Neighboring Property Owners Association • FireWise • Living With Fire • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • Fairview Volunteer Fire Department • County Road Department • NSFC Supporting Committees	<u>Responsible Committee</u>: Fuel Reduction Committee <u>Responsible Person</u>: Chair	High
	ACTION 4: Identify inadequate turnabouts and explore ways and means to enlarge them to appropriate size.	• Property Owners Associations • Property Owners • Neighboring Property Owners Association • FireWise • Living With Fire • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • Fairview Volunteer Fire Department • County Road Department • NSFC Supporting Committees	<u>Responsible Committee</u>: Technical Committee <u>Responsible Person</u>: Chair	High

	ACTION 5: Establish adequate turn abouts for emergency equipment.	• Property Owners Associations • Property Owners • Neighboring Property Owners Association • FireWise • Living With Fire • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • Fairview Volunteer Fire Department • County Road Department • NSFC Supporting Committees	<u>Responsible Committee</u>: Technical Committee <u>Responsible Person</u>: Chair	High
	ACTION 6: Implement a street and road marking program to aid emergency services personnel.	• Property Owners Associations • Property Owners • Neighboring Property Owners Association • FireWise • Living With Fire • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • Fairview Volunteer Fire Department • County Road Department • NSFC Supporting Committees	<u>Responsible Committee</u>: Communication and Signage Committee <u>Responsible Person</u>: Chair	High

	ACTION 7: Develop an accurate map of project area identifying structures and resources useful to fire suppression and emergency response responders.	• Property Owners Associations • Property Owners • Local Churches • Neighboring Property Owners Association • FireWise • Living With Fire • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • Fairview Volunteer Fire Department • County Road Department • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	High
	ACTION 8: Provide updated maps of the area to emergency response groups annually.	• Property Owners Associations • Property Owners • Neighboring Property Owners Association • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • Fairview Volunteer Fire Department • County Road Department • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	Low

	ACTION 9: Encourage county officials to complete E911 for the area.	• Property Owners Associations • Property Owners • Local Churches • Neighboring Property Owners Association • FireWise • Living With Fire • USDA Forest Service • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • Fairview Volunteer Fire Department • County Road Department • County Government • NSFC Supporting Committees	<u>Responsible Committee</u>: Public Relations Committee <u>Responsible Person</u>: Chair	High
	ACTION 10: Develop general evacuation strategies and distribute to landowners.	• Property Owners Associations • Property Owners • Local Churches • Neighboring Property Owners Associations • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • • NSFC Supporting Committees	<u>Responsible Committee</u>: Communication and Signage Committee <u>Responsible Person</u>: Chair	High

	ACTION 11: Work with local church groups and Red Cross as to needs in case of catastrophic fire.	• Property Owners Associations • Property Owners • Local Churches • Neighboring Property Owners Associations • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • American Red Cross • NSFC Supporting Committees	Responsible Committee: Public Relations Committee Responsible Person: Chair	Medium
	ACTION 12: Work with fuel reduction committee to have safe areas located throughout area where people could migrate in event of catastrophic fire.	• Property Owners Associations • Property Owners • Local Churches • Neighboring Property Owners Associations • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	High
	ACTION 13: Work with partners to get GPS maps and/or other mapping resources available for community use and/or for developing updated maps.	• Property Owners Associations • State of Utah, DNR, Div of Forestry, Fire & State Lands • Sheriff's Department • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	High

GOAL: E. Increase water supplies for fire suppression needs.	ACTION 1: Evaluate possible sources of water, including developing pond(s) or developing a well(s).	• Property Owners Associations • Property Owners • Neighboring Property Owners Associations • Utah Department of Natural Resources • FireWise • Living With Fire • Builders and Developers • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • Sanpete County Watershed Authority • NSFC Supporting Committees	Responsible Committee: Technical Committee Responsible Person: Chair	Medium
	ACTION 2: Work with state water resource to develop water rights to support water supplies for fire suppression.	• Property Owners Associations • Property Owners • Local Churches • Utah Department of Natural Resources • FireWise • Living With Fire • Builders and Developers • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • Sanpete County Watershed Authority • NSFC Supporting Committees	Responsible Committee: Technical Committee Responsible Person: Chair	Medium

GOAL: F. Establish perimeter fuel breaks to increase public safety**..**	ACTION 1: Implement a fuel break program within the project area.	• Property Owners Associations • Property Owners • FireWise • Living With Fire • Builders and Developers • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • Sanpete County Watershed Authority • NSFC Supporting Committees	Responsible Committee: Fuel Reduction Committee Responsible Person: Chair	High
	ACTION 2: Work with appropriate partners (private, state, federal) on the best location for fuel breaks and implement the establishment of fuel breaks.	• Property Owners Associations • Property Owners • FireWise • Living With Fire • Builders and Developers • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • Sanpete County Watershed Authority • NSFC Supporting Committees	Responsible Committee: Fuel Reduction Committee Responsible Person: Chair	High

	ACTION 3: Once established, implement maintenance of fuel breaks.	• Property Owners Associations • Property Owners • FireWise • Living With Fire • Builders and Developers • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • Sanpete County Commission • Sanpete County Watershed Authority • NSFC Supporting Committees	Responsible Committee: Technical Committee Responsible Person: Chair	Low
GOAL: G. Evaluate, upgrade, and maintain community wildfire response facilities, equipment, and training.	ACTION 1: Work with appropriate partners to determine equipment, facility, and training needs.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee Responsible Person: Chair	High

	ACTION 2: Work with appropriate partners to develop fire suppression strategies and train personnel.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	Responsible Committee: Public Relations Committee Responsible Person: Chair	Medium
	ACTION 3: Work with appropriate partners to train personnel for Community Emergency Response Team (CERT).	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • American Red Cross • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee Responsible Person: Chair	Medium
	ACTION 4: Work with appropriate partners to train personnel for appropriate levels of fire awareness and fire-fighting skills.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee Responsible Person: Chair	Medium

	ACTION 5: Work with appropriate partners to train personnel for appropriate levels of first aid or emergency medical (EMT) skills.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • American Red Cross • NSFC Supporting Committees	Responsible Committee: Awareness, Education, and Training Committee Responsible Person: Chair	Medium
	ACTION 6: Identify existing equipment, personnel, and external resources.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	Responsible Committee: Technical Committee Responsible Person: Chair	High

GOAL: H. Develop and implement a comprehensive emergency response plan.	ACTION 1: Develop an emergency notification system.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	<u>Responsible Committee</u>: Communication and Signage Committee <u>Responsible Person</u>: Chair	High
	ACTION 2: Develop an emergency action plan.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	<u>Responsible Committee</u>: North Sanpete Fire Council <u>Responsible Person</u>: Chair	High
	ACTION 3: Develop an emergency shelter-in-place plan.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	<u>Responsible Committee</u>: North Sanpete Fire Council <u>Responsible Person</u>: Chair	High

	ACTION 4: Develop secondary escape routes.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • NSFC Supporting Committees	Responsible Committee: Technical Committee Responsible Person: Chair	High
	ACTION 5: Work with appropriate partners to secure cellular telephone service for the area to support emergency communication requirements.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Central Utah Telephone • AT&T • Cellular One • Verizon Wireless • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	Medium

	ACTION 6: Work with appropriate partners to evaluate and secure suitable redundant and fail-safe communications technology (radio communications, UDOT Emergency Radio Transmitter, local sirens, in-home radio receivers, etc.) for the area to support emergency communication requirements.	• Property Owners Associations • Property Owners • Local Churches • FireWise • Living With Fire • Sheriff's Department • Fairview Volunteer Fire Department • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Utah Department of Transportation • Utah State Police • NSFC Supporting Committees	Responsible Committee: Communication and Signage Committee Responsible Person: Chair	Low
GOAL: I. Address regulatory issues impacting community wildfire prevention and response needs.	ACTION 1: Identify rules that impact wildfire safety and make recommendations for improvement.	• Property Owners Associations • Property Owners • Builders and Developers • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • Fairview Volunteer Fire Department • Sanpete County Watershed Authority • NSFC Supporting Committees	Responsible Committee: North Sanpete Fire Council Responsible Person: Chair	Low
	ACTION 2: Evaluate feasibility of using non-profit status structure for homeowners association(s) or partnership with a non-profit organization(s).	• Property Owners Associations • Property Owners • Builders and Developers • State of Utah, DNR, Div of Forestry, Fire & State Lands • USDA Forest Service • Sheriff's Department • NSFC Supporting Committees	Responsible Committee: Accounting Records Committee Responsible Person: Chair	Low

PART III: RESOURCES

Directions: *This section is to be completed through joint effort between the Community Wildfire Committee and fire officials. This section will contain a list of wildfire preparation and response resources that are selected by the community for retention in a community wildfire reference library.*

INSTRUCTIONS

List of Resources

List wildfire preparation and response resources to be retained in a community wildfire reference library, such as brochures, leaflets, books, magazines, videos, charts, etc.

Informational materials

General Fire Prevention

"Are You Living in the Red?" pamphlet (Utah Fire Assessment Project: Bureau of Land Management et.al.)
"Living With Fire" video (Utah Living With Fire)
"Living With Fire" pamphlet (Utah Living With Fire)
"Living With Fire, A Guide for the Homeowner" pamphlet (Great Basin Fire Prevention)
"Protect Your Home Wildfire, Tips for Homeowners" door hanger (Utah Living with Fire)
"Living with Fire" book mark (Utah Living with Fire)
"Living with Fire" refrigerator magnet (Utah Living with Fire)
"Preventing Home Ignitions" video (FireWise)
"Wildfire – Are You Prepared" brochure (American Red Cross)
"Emergency Preparedness Checklist" brochure (American Red Cross)
"Your Family Disaster Supplies Kit" brochure (American Red Cross)
"Your Family Disaster Plan" brochure (American Red Cross)
"Food and Water in an Emergency" brochure (American Red Cross)
"Community Wildfire Preparation Workshop" brochure (Community Solutions)

Landscaping/Building

"Firewise Plants for Utah Landscapes" Utah Forest Facts newsletter (Utah State University Extension)

Community Planning

"Community Wildfire Preparation Program, 2002 Report" brochure (Community Solutions)
"Community Wildfire Preparation Workshop Guide" manual (Community Solutions)
"Potential Wildfire Partners" brochure (Community Solutions)
"Mapping Networks – Questions to Ask" brochure (Community Solutions)

Websites and E-Mail Addresses

FireWise Home Page – http://www.firewise.org
Forest Service Fire Management Website – http://www.fs.fed.us/r3/sfe/fire/index.html
Insurance Services Office (town fire ratings) – http://www.isomitigation.com/
National Fire Protection Association – http://www.nfpa.org
National Interagency Fire Ctr, Wildland Fire Prevention/Education – http://www.nifc.gov/preved/rams.html
U.S. Department of Agriculture "How to Get Information" (contacts) – http://www.usda.gov/news/howto/nre.htm

Utah BLM Fire Management Website – http://www.ut.blm.gov/fire/Assessment/assessment.html
Utah Twenty-First Century Communities Program – http://utahreach.usu.edu/comm21/index.htm
Community Solutions - cmtysolutions@aol.com

PART IV:
TECHNICAL ASSESSMENTS

Community Description

Physical Description

Area

Legal description: T 12 S R 4 E Sections 1 - 24, 30, 31

USGS Map Quadrangle: Indianola, Spencer Canyon and Big Hollow

Topography and Vegetation

Slope:

Range _0_% to _35_%

Aspect:

Aspects in this area face all directions, with homes on many different aspects

Vegetation:

The vegetation in the area is dominated by a fuel model 4, consisting of a Pinyon Juniper mix and Oak Brush. There are large areas of fuel model 6, sage and grass and fuel model 1, short grass. There is a small amount of Aspen and Conifer in the upper elevations of Indian Ridge and Elk Ridge areas.

Water Supply

Ponds / Creeks / other natural water sources:

Pond/Creek	Location / GPS Coordinates	Permanent/ Intermittent	Helicopter Access?	Pump Required?	Volume or Type: Gal/min
Peterson Irrigation Pond 1	12 463093 X 4400657	Intermittent	Yes	Yes	100,000 gal
Peterson Irrigation Pond 2	12 463112 X 4400523	Intermittent	Yes	Yes	100,000 gal
Bigler/Terry Pond	12 460581 X 4406119	Permanent	Yes	Yes	1 mill + gal
Terry Farms Pond	12 458738 X 4403534	Permanent	Yes	Yes	150,000 gal
Hartney Lake	12 452645 X 4401404	Intermittent	Yes	Yes	1 mill + gal
Cowley Irrigation Pond 1	12 455667 X 4402899	Intermittent	Yes	Yes	750,000 gal
Cowley Irrigation Pond 2	12 454940 X 4405252	Intermittent	Yes	Yes	200,000 gal
Beck Resort Lake	12 454501 X 4405396	Permanent	Yes	Yes	1 mill + gal
Beck Irrigation Pond	12 455394 X 4405676	Intermittent	Yes	Yes	100,000 gal
Panorama Fill Station	12 463800 X 4406275	Permanent	No	No	600 gal
Shower Station	12 464070 X 4404397	Permanent	No	No	600 gal
Thistle Creek at Weir	12 460686 X 4406599	Permanent	No	Yes	600 gal/min
Irrigation Risers	Fields around Indianola	Permanent	No	No	800 gal/min

Hydrants:

Location	Type: Dry/Pressurize	Data: *TP&S	GPM (max.) Output	Comments

• None

Water Tanks / Other available water storage (underground cisterns, swimming pools, etc.):

Location	Access	# of gallons*	Responsible Entity	Phone #

• None

Emergency Services / Equipment Capabilities

Describe the types of emergency services and equipment available from local, county, state, and federal resources.

911 Services: Ambulance out of Fairview, 20 minute response time.
Fire Department out of Fairview, 20 minute response time
Fire Department out of Mt. Pleasant, 30 minute response time
Sheriff's deputy for law enforcement

Local: Fire Department out of Elk Ridge (untrained, unstaffed) 1 brush truck, 1 small water tender.

County: Sanpete County Search and Rescue (for searches or evacuation)
Dozers, Graders and other equipment for fire suppression
Sheriff's deputies for law enforcement, traffic control and evacuation

State: Fire Warden (with Engine type VI)
Highway Patrol
Fire Management personnel

Federal: Retardant Air Tankers (out of Hill Airforce Base and Cedar City)
Helicopter type III (out of Richfield)
Small retardant air tankers (out of Fillmore and or Nephi)
Additional air support as needed from around the Western U.S.
Hand Crews from around the Western U.S.
Fire management teams

Hazard Evaluation

Fire History

Fire Name	Start Date	Township/ Range	Section	Acres Burned
PANORAMA WOODS	August 9, 1980	T12S R4E	1	2
STEELES FIRE	July 19, 1982	T12S R3E	3	3
MILBURN REST	July 21, 1982	T13S R4E	3	0.25
MT. BALDY	September 2, 1982	T12S R3E	9	0
HIDE AWAY VALLEY	July 1, 1984	T12S R4E	2	0
DRY CREEK	July 21, 1984	T13S R5E	4	1
MILBURN	July 6, 1985	T13S R4E	12	0.1
MUD SPRING	September 8, 1986	T13S R4E	4	0.25
SKYVIEW DAIRY	June 25, 1987	T13S R4E	35	0.25
FAIRVIEW WEST	June 28, 1987	T13S R4E	2	1
INDIANOLA	August 5, 1987	T12S R4E	5	2
GAGING STATION	September 12, 1987	T13S TR5E	24	0
MT. BALDY	September 25, 1987	T12S R3E	26, 27, 34, 35	3000
DRY CRK/MILBURN	October 10, 1988	T13S R5E	18	700
ELVON GRANT	August 2, 1989	T12S R4E	8	1
UINTA GULCH	August 16, 1989	T13S R4E	6	4
MILBURN FARM	October 31, 1989	T13S R4E	26	0.1
SECTION 16	July 27, 1990	T12S R3E	16	0.25
SKYLINE E.INDIANOLA	July 29, 1990	T12S R5E	9	0.25
PANORAMA WOODS CABIN	September 2, 1990	T12S R4E	12	0.25
SOUTH FORK	September 28, 1990	T12S R5E	9	0.25
LONE PINE	July 10, 1992	T12S R5E	29	0.1
BLACKHAWK	August 8, 1992	T12S R4E	9	0
GEORGE MOORE	July 5, 1993	T12S R4E	10	0.25
ROBERT OLSEN	September 14, 1993	T12S R4E	36	0.25
INDIANOLA ROADSIDE	July 7, 1994	T12S R4E	21	0.38
OAK CREEK RIDGE	September 12, 1994	T13S R5E	9	0.25
CAMPER FIRE	July 22, 1995	T13S R5E	24	0
INDIAN RIDGE	September 16, 1995	T12S R4E	31	0.5
WHITE PINE	September 17, 1995	T13S R5E	27	0.25
SPENCER CANYON	June 24, 1996	T12S R3E	9	1
BROWN'S PEAK	June 26, 1999	T12S R 5E	6	0.1
WHEELER	July 4, 2001	T13S R4E	3	0.25
BANKS	July 8, 2001	T13S R4E	27	0.1
HIDE AWAY HILL	July 28, 2001	T12S R4E	10	0.1
BIG HORN	August 1, 2001	T12S R4E	7	3
PIPELINE	August 12, 2001	T12S R5E	3	0.1
LARRY BURKE	August 25, 2001	T13S R4E	11	2
STONE QUERY	August 29, 2001	T13S R4E	26	0.1
FAIRVIEW PEAK	August 30, 2001	T13S R5E	31	0.1
GILLESPIE	September 2, 2001	T13S R5E	18	0.1
DRY CREEK	October 7, 2001	T12S R5E	27	0.25
COX	June 1, 2002	T13S R4E	25	0.25
DEVILS KITCHEN	July 10, 2002	T12S R3E	6	0.2
MUDD	August 19, 2002	T31S R4E	31	0.25
OAKER HILLS	October 4, 2002	T12S R4E	31	0.1
MEYERS FIRE	June 1, 2003	T12S R4E	14	0.1
SNAIL HOLLOW	August 14, 2003	T12S R4E	24	0.1

Subdivision Rating

The subdivision is **high** for wildfire hazard, based on the following criteria:

Rating Points	Slope	Aspect	Topography	Response Time	Fuel type	Desity	Fire History 25 Years	Dwellings Per Acre
1	<10%	North	Valley Bottom	<15 min	Hardwoods	20%	<1/township	<.01
2	20%	East	Low on Slope	30 min	Gras/Sage	40%	1 - 2/township	.01 - .25
3	30%	Flate	Mid Slope	45 min	Pin./Juniper	60%	3 - 7/township	.25 - .5
4	45%	South	ridge Top	60 min	Mtn. Brush	80%	8 - 13/township	.5 - 1
5	>60%	West	Canyon/Draw	>60 min	Conifer	100%	14+/township	1 – 2
North Sanpete Region Score	2	4	3	2	3	3	4	3
Overall Score	24	High						

Rating Index

1 - 10	Low
11 - 20	Moderate
21 - 30	High
31 - 40	Extreme

Property / Structure Rating

All lots will be rated for wildfire hazard, as arranged by the Fire Council with fire officials and as permitted by the owners. The estimated time of completion for all ratings is ____October 2005_____.

Documentation of individual property ratings should be included in the Appendix.

Expected Fire Behavior

a. Fuel Model 4 Pinyon, Juniper & Oak

Slope	Rate of Spread	Flame Length
1. 0%	153 chains/hr	27 ft
2. 10%	154 chains/hr	27 ft
3. 20%	159 chains/hr	27 ft
4. 30%	166 chains/hr	28 ft

b. Fuel Model 6 Sage and grass

Slope	Rate of Spread	Flame Length
0%	43 chains/hr	7 ft
10%	43 chains/hr	7 ft
20%	44 chains/hr	7 ft
30%	47 chains/hr	7 ft

c. Fuel Model 1 grass

Slope	Rate of Spread	Flame Length
0%	136 chains/hr	5 ft

10%	136 chains/hr	5 ft
20%	136 chains/hr	5 ft
30%	136 chains/hr	5 ft

Detailed fire behavior documentation included in the Appendix.

Community Prescription

Fuel Modification Projects

Project (briefly identify)	Timeframe	Person in Charge
• Create defensible space around each home	October 2008	N. Sanpete Fire Council
• Thin and remove vegetation on perimeter roads for fuel breaks	October 2006	N. Sanpete Fire Council

Defensible space and fuel breaks will require annual treatment to maintain them. Treatments may be mechanical or chemical.

Infrastructure Improvements (Utilities, Water Developments, Equipment Acquisition / Repair, etc,)

Project (briefly identify)	Timeframe
• Create an alternate escape road out of Blackhawk	October 2004
• Create alternate escape routes out of Indian Ridge going south and north	October 2004
• Develop a pond on the valley floor that can serve as a helicopter dip sight	October 2006
• Develop as many dry hydrants in each community as possible	October 2005
• Establish a centralized, trained fire department	October 2005
• Improve main roads in each community to 24 ft of traversable surface	October 2007

Education

Goal (briefly identify)	Timeframe
• Train 90% of the home owners regarding defensible space	October 2005
• Train fire leadership to write defensible space prescriptions	May 2004
• Establish a resource library for wildfire information	May 2004

Wildfire Response / Pre-Attack Plan

Emergency Notification

In the event of a wildfire, report should be made immediately to Sanpete County Sheriff's dispatch (911) who will dispatch appropriate fire suppression resources. Next, notification should be made to the appropriate home owner's association leadership of the subdivision or subdivisions threatened by the fire. The LDS bishop should be notified so that the church structure can be used to notify everyone in the area of the threat to their property.

Hide Away Valley	Donna Pendry President	435 427-3264
Indian Ridge	Chuck Cummins President	801 787-8444
Panorama Woods		
Oaker Hills	Lynn Warner President	801 798-3818
Elk Ridge	David Martinez President	801 966 5941
LDS Bishop	Carl Winters	435 427-3399

Fire Protection Responsibilities

Fire protection responsibilities in the North Sanpete Area are assigned as follows. Individual home fires will be suppressed by the Fairview Fire Department, who will also provide command leadership during suppression activities. They may seek assistance as needed in their judgment from neighboring fire departments.

Wildland fires on privately owned land and state land will fall under the direction of the Sanpete County Fire Warden. He will provide command leadership and mobilize local, regional and national resources as needed for fire suppression activities. Federal firefighting resources will be mobilized as needed to assist local resources.

Fire suppression responsibilities for fire on Federal Forest land will be handled by the Manti LaSal National Forest. Local firefighting resources may assist the Forest Service as needed.

Multi-jurisdictional fires will be managed using unified command with representatives from each involved agency.

Response time to the Indianola Valley will generally not be less than 25 minutes because of fire department mobilization time and travel time involved.

Predetermined Command, Staging and Helibase Areas

Command Posts may be set up in the following areas:

- The pavilion inside Hide Away Valley.
- The Indian Ridge Lodge House.
- The Junction of hwy 89 and the Big Hollow road in the fields.
- The Junction of hwy 89 and the Hide Away Valley road in the fields.
- In fields along the road to Big Horn Ranch

Staging Areas may be set up in the following areas:

- In fields along the road to Big Horn Ranch.
- The Junction of hwy 89 and the Big Hollow road in the fields.
- The Junction of hwy 89 and the Hide Away Valley road in the fields.

Helibases may be set up in the following areas:

- In fields along the road to Big Horn Ranch.
- The Junction of hwy 89 and the Big Hollow road in the fields.
- The Junction of hwy 89 and the Hide Away Valley road in the fields.
- South of the Bigler/Terry irrigation pond.

Safety Zones and In-place Sheltering

In all events, where the lives of citizens are threatened, the first priority will be to evacuate the area. No in-place sheltering will be attempted as long as there is an escape route available out of the community. There are currently no available in-place sheltering or safety zones available in any of the communities. There is no place where the vegetation is sufficiently thin so as to impede fire progress. However, if trapped within communities the following places may be considered as a last resort, the grass area near the pavilion in Hide Away Valley, The grass area around Hartney Lake in Indian Ridge and the grass area in the south end of Panorama Woods. Also as last resort, citizens may consider remaining in homes where an effective defensible space has been created. None of these areas are to be considered as good safety zones.

Traffic Control

All traffic control within the subdivisions will be the responsibility of the Sanpete County Sheriff and his deputies. Traffic control along Hwy 89 will be handled by Sanpete County deputies and the Utah State Highway Patrol.

Suppression Operational Mode

In nearly all cases, wildland fires will be suppressed with an aggressive offensive operational mode.

Defensive operations will only be employed during periods when high resource values such as home are in imminent danger of being burned. Then firefighters will employ a defensive mode to protect the high value resources. Only the firefighters and equipment needed in defensive mode will be so employed. All other resources will be used in offensive operations. If the demand for defensive forces requires all available fire fighting resources, and the likelihood of success is high that homes will be preserved, then all firefighting resources will be so employed until additional resources can be procured. If conditions make a defensive mode unlikely to succeed in protecting homes, then firefighting resources will be employed in an offensive mode to contain and control the main fire until reinforcements can provide enough manpower to allow defensive activities.

Determining Resources Needed

The resources utilized on all wildland fires will be representative of the values at risk and the difficulty of suppression. Fires that pose no threat to homes and can be extinguished by local resources will be handled with local resources. Only those fires whose complexity and threat justify the use of expensive regional and national resources will be so staffed. If a fire poses a threat to a community, every possible effort will be made and appropriate available resource including local, regional and national will be used.

Local resources will generally include:

- Local volunteer fire department personnel and engines.
- Local Forest and BLM personnel and engines.
- A single engine air tanker.
- A type III helicopter.
- Mechanized equipment such as bull dozers and road graders.

Regional and national resources will include:

- Firefighting hand crews.
- Heavy air tankers.
- Additional type III helicopters.
- Type I and type II helicopters.
- Type I and type II fire management teams.

Pre-suppression Goals

The community can make the area more fire safe by pursuing the following goals:

- Educate the residents about the threat of wildfire and what they can do to reduce the threat.
- Create defensible space around homes.
- Insure that road systems are adequate to handle resident traffic and firefighting equipment at the same time.
- Establish a local, trained fire department.
- Develop water sources within the housing areas that can be used in fire suppression.
- Establish fire breaks around the perimeters of each community.

APPENDIX

INSTRUCTIONS

This section is to be filled as needed by both the Community Wildfire Committee and fire officials. Items can include, but are not limited to:

- Contact Lists
- Homeowner Checklists
- Assessment Project Worksheets
- Examples / Sample documents
- Maps
- Glossary

Appendix A – Contact Lists

Utah Division of Forestry, Fire and State Lands
Utah Resource & Development Councils
Emergency Management / Fire Agencies
Utah Associations of Governments
Other Planning / Training Resources
American Red Cross
Utah Department of Natural Resources
USDA Forest Service ~ Utah Offices
Bureau of Indian Affairs ~ Utah Offices
Tribes
Bureau of Land Management ~ Utah Offices
Fish and Wildlife Service ~ Utah Offices
National Park Service ~ Utah Offices
Emergency Call-Down List ~ TBD

Appendix B – Maps

Topography ~ TBD
Boundaries ~ TBD
Escape routes ~ TBD
Safety zones ~ TBD

Appendix C – Assessments / Worksheets

Survivable Space Assessment Worksheets ~ TBD
Wildfire Hazard Rating Form ~ TBD
Wildland Urban Interface Project Sheet (funding) ~ TBD

Appendix D – Checklists / Homeowner Information

Fire Disaster Potential Checklist for Homeowners ~ TBD
Fire Disaster Potential Checklist for Developers ~ TBD
Landscaping and Survivable Space Checklist ~ TBD
Construction Checklist ~ TBD
Fire Resistant Plants ~ TBD
Emergency Response checklist ~ TBD
Zoning recommendations checklist ~ TBD

Appendix E – Other

Wildfire Glossary ~ TBD

AGENCY CONTACT INFORMATION

Utah Department of Natural Resources

Division of Forestry, Fire and State Lands

Bear River Area Office
Craig Pettigrew, Area Manager
*Blain Hamp, Acting FMO**

1780 N. Research Parkway, Ste 104
N. Logan, UT 84341-1940
(435) 752-8701

Wasatch Front Area Office
Dick Buehler, Area Manager
Barbara Gardner, Area Forester

1594 W. North Temple, Ste 3520
Salt Lake City, UT 84116
(801) 538-5555

Southwestern Area Office
Ron Larsen, Area Manager
Larry LeForte, FMO

585 North Main
Cedar City, UT 84720-2643
(435) 586-4408

Northeastern Area Office
Dale Jablonski, Area Manager
Stephen Rutter, FMO

152 East 100 North
Vernal, UT 84078-2126
(435) 781-5463

Central Area Office
Kelly Allen, Area Manager
Mike Melton, FMO

115 East 900 North
Richfield, UT 84701-1847
(435) 896-5697

Southeastern Area Office
Gary Cornell, Area Manager
Heather O'Hanlon, Interface Project Coordinator

1165 S. Highway 191, Suite 6
Moab, UT 84532-3002
(435) 259-3766

Fred Johnson
Sanpete County Fire Warden
160 North Main
Manti, UT 84642
(435) 835-2117
(435) 851-1546 cellular
fredjohnson@utah.gov

* FMO = Fire Management Officer*

Utah Resource & Development Councils

Bear River RC&D
1860 N. 100 East
No. Logan, UT 84341
(435) 753-3871

Castlelands RC&D
P.O. Box 1287
Huntington, UT 84528
(435) 687-2985

Color Country RC&D
2460 W. Highway 56 #5
Cedar City, UT 84720
(435) 586-7449

Dinosaurland RC&D
240 W. Highway 40
Roosevelt, UT 84066
(435) 722-0884

Mountainlands RC&D
2210 S. Hwy 40, Suite B
Heber City, UT 84032-3527

Panoramaland RC&D
3490 N. 600 E.
Richfield, UT 84701
(435) 896-8965 ext. 42

Bonneville RC&D
5370 S. 1030 W.
Murray, UT 84123
(801) 262-6838

Emergency Management / Fire Agencies

Federal Emergency Mgmt Agency
Denver Federal Center
Building 710, Box 25267
Denver, CO 80225-0267
(303) 235-4800

Utah Comprehensive Emergency Management
Rm. 1110, State Office Bldg.
Salt Lake City, UT 84114
(801) 538-3400

Utah State Fire Marshal
5272 S. College Dr., Ste 302
Murray, UT 84123-2611
(801) 284-6350

Northern Utah Interagency Fire Center
DES North Building
17800 South Camp Williams Road
Riverton, UT 84065
(801) 908-1900

Richfield Interagency Fire Center
1809 Industrial Parkway Road
Richfield, UT 84701
(435) 896-8404
Noni Dalton or
Jill Ivie (435) 896-1573

Utah Associations of Governments

Bear River Assn. Of Governments
170 N. Main
Logan, UT 84321
(435) 752-7242

Mountainland Assn. Of Governments
586 East 800 North
Orem, UT 84097-4146
(801) 229-3800

Southeastern Assn. Of Governments
375 S. Carbon Ave., Box 1106
Price, UT 84501
(435) 637-5444

Five County Assn. Of Governments
906 N. 1400 W., Box 1550
St. George, UT 84770
(435) 673-3548

Six-County Assn. Of Governments
250 North Main
Richfield, UT 84701
(435) 896-9222

Uintah Basin Assn. Of Governments
855 E. 200 N. (112-3)
Roosevelt, UT 84066
(435) 722-4518

Other Planning / Training Resources

Community Solutions, Inc.
Kathy Hammons, Janet Johnson
386 East 600 North
Midway, UT 84049
(435) 657-0668
cmtysolutions@aol.com

Utah Rural Development Council
351 W. Center Street, Admin 304D
Cedar City, UT 84720
(435) 586-7852

Wasatch Front Regional Council
420 W. 1500 S., Ste 200
Bountiful, UT 84010
(801) 292-4469

American Red Cross

Cache County Chapter	Greater Salt Lake Area Chapter	Southern Nevada Chapter
1115 North 200 East, Ste 140 Logan, UT 84341 (435) 752-1125	465 South 400 East, Box 3836 Salt Lake City, UT 84110-3836 (801) 323-7000	3672 N. Rancho Drive Las Vegas, NV 89130 (702) 791-3311
Ogden Chapter 2955 Harrison Boulevard Ogden, UT 84403 (801) 627-0000	**Mountain Valley Chapter** 865 North Freedom Blvd. Provo, UT 84604-3315 (801) 373-8580	**Western Colorado Chapter** 506 Gunnison Avenue Grand Junction, CO 81501 (970) 242-4851

Utah Department of Natural Resources

Divisions other than Forestry, Fire and State Lands

Division of Wildlife Resources	Division of Water Rights	Division of Parks & Recreation
1594 W. North Temple Salt Lake City, UT 84116 (801) 538-4700	1594 W. No. Temple, Ste 220 Salt Lake City, UT 84116 (801) 538-7240	1594 W. No. Temple, Ste 116 Salt Lake City, UT 84116 (801) 538-7220
Regional Office – Ogden (801) 476-2740	Regional Office – Logan (435) 752-8755	Northeast Region (435) 649-9109
Regional Office – Vernal (435) 789-3103	Regional Office – Vernal (435) 781-5327	Northwest Region (801) 533-4229
Regional Office – Springville (801) 489-5678	Regional Office – Price (435) 637-1303	Southeast Region (435) 259-3755
Regional Office – Price (435) 636-0263	Regional Office – Richfield (435) 896-4429	Southwest Region (435) 586-2789
Regional Office – Cedar City (435) 865-6103	Regional Office – Cedar City (435) 586-4231	*For information on State Parks:* *http://www.stateparks.utah.gov*
Division of Oil, Gas & Mining 1594 W. No. Temple, Ste 1210 Salt Lake City, UT 84116 (801) 538-5340	**Division of Water Resources** 1594 W. No. Temple, Ste 310 Salt Lake City, UT 84116 (801) 538-7230	**Utah Geological Survey** 1594 W. No. Temple, Ste 3110 Salt Lake City, UT 84116 (801) 538-3300

U.S. Department of Agriculture

Forest Service ~ Utah Offices

Intermountain Regional Office
Federal Building
324 25th Street
Ogden, UT 84401
(801) 625-5306

Dixie National Forest
1789 N. Wedgwood Lane
Cedar City, UT 84720
(435) 865-3700

Uinta National Forest
88 West 100 North
Provo, UT 84601
(801) 342-5780

Ashley National Forest
355 North Vernal Avenue
Vernal, UT 84078
(435) 789-1181

Fishlake National Forest
115 East 900 North
Richfield, UT 84701
(435) 896-9233

Wasatch-Cache National Forest
8236 Federal Building
125 South State Street
Salt Lake City, UT 84138
(801) 524-3900

Manti-LaSal National Forest
540 N. Main
Ephraim, UT 84627
(435) 283-4151
Tom Shore, District Ranger, Sanpete Ranger District

Manti-LaSal National Forest
599 West Price River Drive
Price, UT 84501
(435) 637-2817

U.S. Department of Interior

Bureau of Indian Affairs ~ Utah Offices

Phoenix Area Office
For Arizona, Nevada, Utah
P.O. Box 10
Phoenix, AZ 85001
(602) 379-6600

Southern Paiute Field Station
P.O. Box 720
St. George, UT 84711
(435) 674-9720

Uintah & Ouray Agency
P.O. Box 130
Fort Duchesne, UT 84026
(435) 722-2406

Tribes

Skull Valley Goshute Reservation
P.O. Box 150
Grantsville, UT 84029
(801) 363-7726

Goshute Business Council
P.O. Box 6104
Ibapah, UT 84034
(435) 234-1136

Paiute Indian Tribe
Of Utah Tribal Council
600 North 100 East Paiute Drive
Cedar City, UT 84720
(435) 586-1112

Uintah & Ouray Tribal
Business Committee
P.O. Box 190
Fort Duchesne, UT 84026
(435) 722-5141

U.S. Department of Interior

Bureau of Land Management ~ Utah Offices

Salt Lake Field Office
2370 South 2300 West
Salt Lake City, Utah 84119
(801) 977-4300

Vernal Field Office
170 South 500 East
Vernal, Utah 84078
(435) 781-4400

Fillmore Field Office
35 East 500 North
Fillmore, Utah 84631
(435) 743-3100

Richfield Field Office
150 East 900 North
Richfield, Utah 84701
(435) 896-1500

Price Field Office
125 South 600 West
Price, Utah 84501
(435) 636-3600

Moab Field Office
82 East Dogwood
Moab, Utah 84532
(435) 259-2100

Cedar City Field Office
176 East D.L. Sargent Drive
Cedar City, Utah 84720
(435) 586-2401

St. George Field Office
345 East Riverside Drive
St. George, Utah 84720
(435) 688-3200

Kanab Field Office
318 North First East
Kanab, Utah 84741
(435) 644-4600

Monticello Field Office
435 North Main, P.O. Box 7
Monticello, Utah 84535
(435) 587-1500

Grand Staircase-Escalante
National Monument
190 E. Center
Kanab, UT 84741
(435) 644-4300

U.S. Department of Interior
Fish and Wildlife Service ~ Utah Offices

Ecological Services Field Office
2369 West Orton Circle
West Valley City, UT 84119
(801) 975-3330

Senior Resident Agent – Ogden
P.O. Box 2369
Ogden, UT 84402
(801) 625-5570

Fish Springs Natl. Wildlife Refuge
Highway 36, Pony Express Trail
Ibapah, UT 84034
(435) 831-5353

Colo. River Wildlife Mgmt Refuge, **Ouray Natl. Wildlife Refuge**
19001 East Wildlife Refuge Road
Randlett, UT 84063-2042
(435) 545-2522

Colorado River Fishery Project
1380 South 2350 West
Vernal, UT 84078-2042
(435) 789-4078

Fish & Wildlife Service Management Assistance Office
1380 South 2350 West
Vernal, UT 84078-2042
(435) 789-0354

U.S. Department of Interior
National Park Service ~ Utah Offices

Arches National Park
P.O. Box 907
Moab, UT 84532-0907
(435)719-2100 (Headquarters)

Bryce Canyon National Park
P.O. Box 170001
Bryce Canyon, UT 84717-0001
(435) 834-5322 (Headquarters)

California Natl. Historic Trail
324 S. State Street, Suite 250
P.O. Box 45155
Salt Lake City, UT 84145-0155
(801) 539-4095 (Headquarters)

Canyonlands National Park
2282 S. West Resource Blvd.
Moab, UT 84532-3298
(435) 719-2100 (Headquarters)

Capitol Reef National Park
HC 70 Box 15
Torrey, UT 84775-9602
(435) 425-3791 (Visitor Info)

Cedar Breaks Natl. Monument
2390 W. Highway 56, Suite 11
Cedar City, UT 84720-4151
(435) 586-9451 (Visitor Info)

Glen Canyon Natl. Recreation Area
P.O. Box 1507
Page, AZ 86040-1507
(928) 608-6200 (Headquarters)

Golden Spike National Historic Site
P.O. Box 897
Brigham City, UT 84302-0897
(435) 471-2209 (Visitor Info)

Hovenweep National Monument
McElmo Route
Cortez, CO 81321
(435) 719-2100 (Headquarters)

Mormon Pioneer Natl. Historic Trail
Long Distance Trails Office
324 South State, Suite 250
Salt Lake City, UT 84145-0155
(801) 539-4095 (Headquarters)

Natural Bridges Natl. Monument
HC 60 Box 1
Lake Powell, UT 84533-0101
(435) 719-2100 (Headquarters)

Pony Express Natl. Historic Trail
Long Distance Trails Office
325 South State St., Ste 324
Salt Lake City, UT 84145-0155
(801) 539-4093 (Headquarters)

Rainbow Bridge Natl. Monument
PO Box 1507
Page, AZ 86040-1507
(520) 608-6200 (Headquarters)

Timpanogos Cave Natl. Monument
R.R. 3, Box 200
American Fork, UT 84003-9803
(801) 756-5239 (Headquarters)

Zion National Park
SR 9
Springdale, UT 84767-1099
(435) 772-3256

Appendix G

FEMA Hazard Profile

A hazard profile was created for each hazard in each county within Six County Association of Governments jurisdiction. These profiles including potential severity or magnitude, frequency, location, seasonal pattern, duration, and speed of onset, were developed based on a model suggested by FEMA Region VIII. The information within each field of the table was derived by the Counties participating in the mitigation planning process based on GIS risk analysis, history of occurrence, and expert advice.

FEMA Hazard Profile

Frequency	Possible
Severity	Catastrophic
Location	A large magnitude earthquake would produce ground shaking felt throughout the entire region. Surface fault rupture is expected in areas of known historic fault movements, for earthquake with a magnitude 6.5 or greater.
Seasonal Pattern	None
Duration	Actual ground shaking will be under one minute yet after shocks may occur for weeks after.
Speed of Onset	No warning

Frequency:

- Highly Likely
  Near 100% probability in next year.
- Likely
  Between 10% and 100 % probability in the next year, or at least one chance in 10 year period.
- Possible
  Between 1% and 10% probability in the next year, or at least one chance in next 100 years.
- Unlikely
  Less than 1% probability in the next 100 years.

Severity or Magnitude:

- Catastrophic
  - Multiple fatalities if event were to occur
  - Complete shutdown of facilities for 30 days or more
  - More than 50 percent of property is severely damaged

- Critical
    - Injuries and/or illnesses results in permanent disability
    - Complete shutdown or critical facilities for at least 2 weeks
    - More than 25 percent of property is severely damaged
- Limited
    - Injuries and/or illnesses result in permanent disability
    - Complete shut down of critical facilities for more than one week
    - More than 10 percent of property is severely damaged
- Negligible
    - Injuries and/or illnesses are treatable with first aid
    - Minor quality of life lost
    - Shutdown of critical facilities and services for 24 hours or less
    - Less than 10 percent of property is severely damaged

Location:
Areas most likely to be affected or the sectors most likely to be affected.

Seasonal Pattern:
The particular season the event is most likely to occur. Examples include tornado season and hurricane season.

Duration:
The amount of time between when and event starts to when the event ends. For example the ground shaking caused by an earthquake is only a minute where as hurricanes can event can be several days.

Speed of Onset:
Probable amount of warning time before an event occurs.

- Minimal or no warning time
- 6 to 12 hours warning time
- 12 to 24 hours warning time
- More than 24 hours warning

Warning time is vital as it allows people seek safe locations or shelters and prepare their property in hopes of reducing damages.

Appendix H

Community Pre-Disaster Mitigation Planning Meetings

In October and November of 2002, SCAOG staff had mitigation planning meetings with all six county commissions at their regularly scheduled public meetings. The staff also had planning meetings where the Disaster Mitigation Survey* (see below) was discussed with the 48 mayors in the region. On November 6, 2002 the staff had a planning meeting with the SCAOG Executive Board at their regularly scheduled public meeting.

Juab County		
Commission	October 21, 2002	October 6, 2003
Eureka	October 29, 2002	October 28, 2003
Levan	October 29, 2002	October 28, 2003
Mona	October 29, 2002	October 28, 2003
Nephi	October 29, 2002	October 28, 2003
Rocky Ridge	October 29, 2002	November 10, 2003
Millard County		
Commission	October 28, 2002	October 6, 2003
Delta	November 7, 2002	November 6, 2003
Fillmore	November 7, 2002	November 6, 2003
Hinckley	November 7, 2002	November 6, 2003
Holden	November 7, 2002	November 6, 2003
Kanosh	November 7, 2002	November 6, 2003
Leamington	November 7, 2002	November 6, 2003
Lynndyl	November 7, 2002	November 6, 2003
Meadow	November 7, 2002	November 6, 2003
Oak City	November 7, 2002	November 6, 2003
Scipio	October 31, 2002	October 30, 2003
Piute County		
Commission	October 15, 2002	October 14, 2003
Circleville	November 5, 2002	November 4, 2003
Junction	November 5, 2002	November 4, 2003
Kingston	November 5, 2002	November 4, 2003
Marysvale	November 5, 2002	November 4, 2003
Sanpete County		
Commission	October 22, 2002	October 7, 2003
Centerfield	November 1, 2002	October 10, 2003
Ephraim	October 17, 2002	October 10, 2003
Fairview	October 17, 2002	October 9, 2003
Fayette	November 1, 2002	October 10, 2003
Fountain Green	October 17, 2002	October 10, 2003
Gunnison	November 1, 2002	October 10, 2003
Manti	November 1, 2002	October 9, 2003
Mayfield	November 1, 2002	October 10, 2003
Moroni	October 17, 2002	October 9, 2003

Mt. Pleasant	October 17, 2002	October 9, 2003
Spring City	October 17, 2002	October 9, 2003
Sterling	November 1, 2002	October 10, 2003
Wales	October 23, 2002	October 10, 2003
Sevier County		
Commission	October 21, 2002	October 20, 2003
Aurora	October 31, 2002	October 30, 2003
Annabella	November 8, 2002	November 7, 2003
Elsinore	October 31, 2002	November 7, 2003
Glenwood	November 8, 2002	November 7, 2003
Joseph	November 8, 2002	November 7, 2003
Koosharem	November 4, 2002	November 13, 2003
Monroe	October 30, 2002	October 31, 2003
Redmond	October 23, 2002	October 30, 2003
Richfield	November 8, 2002	November 7, 2003
Salina	January 17, 2003	October 30, 2003
Sigurd	November 8, 2002	November 7, 2003
Wayne County		
Commission	November 4, 2002	September 29, 2003
Bicknell	November 4, 2002	November 3, 2003
Hanksville	November 4, 2002	November 3, 2003
Loa	November 4, 2002	November 3, 2003
Lyman	November 4, 2002	November 3, 2003
Torrey	November 4, 2002	November 3, 2003

North Sanpete and Bullion Canyon (Marysvale) Fire Planning Meeting in Ephraim, October 22-23, 2003.

*What follows is the complete text of the survey:

DISASTER MITIGATION

The Federal Emergency Management Agency (FEMA) has been authorized by Congress to fund Disaster Mitigation Plans. Communities that participate can apply for mitigation funding with FEMA paying 75% and other sources including local paying 25%. In addition, these same communities may receive FEMA assistance in the case of a natural disaster. Utah has decided to plan at the regional level contracting with the AOG's to develop the plans in conjunction with the Emergency Managers.

Please answer the following questions and be prepared to discuss it further in our scheduled visit:

1. Community____

2. Name/Title of person filling out questionnaire____

3. What are the natural hazards that threaten your community (i.e. Drought, Earthquake, Fire, Flood, etc.)?____
____
____
____
____
____
____

4. Who is your Disaster Point of Contact?____

5. Are you participating in the National Flood Insurance Program (NFIP)? Y N

6. What are your previous mitigation projects?
____
____
____
____
____
____
____

7. What are your potential mitigation projects?
____
____
____
____
____
____
____

8. What are your current Geographic Information Systems (GIS) capabilities?
____
____
____
____

9. Any Other Comments?
____
____
____
____

The completed surveys are available at the Six County Planning Offices, 250 N Main, Richfield, UT 84701.

Appendix I

Glossary of Terms

Abutment (dam) - the valley side against which a dam is constructed.

Acre-foot of water - approximately 326,000 gallons of water, or approximately a football field covered by one foot of water.

Active Faults - An active fault is defined as a fault displaying evidence of displacement along one or more of its traces during Holocene time (about the last 11,000 years).

Aftershocks - earthquakes during the seconds, hours, days to months following a larger earthquake (main shock) in the same general region.

Alluvial fan - a cone-shaped deposit of stream sediments, generally deposited at the base of a mountain where a stream encounters flatter terrain.

Amplitude (seismic waves) - the maximum height of a wave crest or depth of a trough. Amount the ground moves as a seismic wave passes, as measured from a seismogram.

ATV All Terrain Vehicle

Avalanche path - the area in which a snow avalanche runs; generally divided into starting zone, track, and run out zone.

Basin and Range physiographic province - consists of north-south-trending mountain ranges separated by valleys, bounded by the Rocky Mountains and the Colorado Plateau to the east and the Sierra-Cascade Mountains to the west (includes western Utah).

Bearing capacity - the load per unit area, which the ground can safely support without excessive yield.

Bedrock - solid in-place rock, sometimes exposed and sometimes concealed beneath the soil.

Collapsible soil (hydro compaction) - loose, dry, low-density soil that decreases in volume or collapses when saturated for the first time following deposition.

Critical Areas - Environmentally sensitive areas, which include wetlands fish and wildlife habitat conservation areas; geologically hazardous areas; areas with a critical recharging effect on aquifers used for potable water; and frequently flooded areas. Critical areas have measurable characteristics which, when combined, create a value for or potential risk to public health, safety and welfare.

Critical/Essential Facilities - Structures meeting one or more of the following criteria:

- Fire stations, police stations, storage facilities for vehicles/equipment needed after a hazard event, and emergency operation centers.
- Hospitals, nursing homes, and housing which is likely to contain occupants who may not be sufficiently mobile to avoid injury or death as a result of a hazardous event
- Public and private utility facilities, which are vital to maintaining or restoring normal services to, damaged areas after a hazardous event.
- Structures or facilities that produce, store, or use highly flammable, explosive, volatile, toxic and/or water reactive materials

Debris flow - involves the relatively rapid, viscous flow of surficial material that is predominantly coarse grained.

Debris slide - involves predominantly coarse-grained material moving mainly along a planar surface.

Delta - a deposit of sediment formed at the mouth of a river where it enters an ocean or lake.

Earth flow - involves fine-grained material that slumps away from the top or upper part of a slope, leaving a scarp, and flows down to form a bulging toe.

Earthquake - a sudden motion or trembling in the earth as fracture and movement of rocks along a fault release stored elastic energy.

Earthquake Fault Zone - earthquake fault zones are regulatory zones around active faults. The zones are used to prohibit the location of critical facilities and structures designed for human occupancy from being built astride an active fault. Earthquake Fault Zones are plotted on topographic maps at a scale of 1-inch equals 2,000 feet. The zones vary in width, but average about one-quarter mile wide.

Earthquake induced Seiches - Earthquake generated water waves causing inundation around shores or lakes and reservoirs.

Epicenter - the point on the earth's surface directly above the focus of an earthquake.

Erosion - the removal of earth or rock material by many types of processes, for example, water, wind, or ice action.

Expansive soil and rock - soil and rock, which contain clay minerals, that expands and contracts with changes in moisture content.

Fault - A -break in the earth along which movement occurs.

Fault segment - section of a fault that behaves independently from adjacent sections.

Fault zone - an area containing numerous faults.

FEMA - The Federal Emergency Management Agency was authorized under Section 404 of the Stanford Act. Provides funding for hazard mitigation projects that are cost-effective and comply with existing post-disaster mitigation programs and activities. These projects cannot be funded through other programs to be eligible.

Fill - material used to raise the surface of the land generally in a low area.

Fire-resistant vegetation - plants that do not readily ignite and burn when subjected to fire because of inherent physiological characteristics of the species such as moisture content, fuel loading, and fuel arrangement.

Flood plain - an area adjoining a body of water or natural stream that has been or may be covered by floodwater.

Flood way - An area of land immediately adjacent to a stream or river channel that, in times of flooding, becomes an enlarged stream or river channel and carries the floodwater with the highest velocity.

Floodplain - an area adjoining a body of water or natural stream that has been or may be covered by floodwater.

Floodplain (100 year) - Floodplains that have the potential to flood once every 100 years or that has a one percent chance of flooding equal to or in excess of that in any given year.

Fluvial - concerning or pertaining to rivers or streams.

Focus - the point of origin of an earthquake within the earth, and the origin of the earthquake's seismic waves.

Formation (geologic) - a map able rock unit consisting of distinctive features/rock types separate from units above and below.

Frequency (seismic waves) - the number of complete cycles of a seismic wave passing a point during one second.

Fuel (fire) - vegetation, building material, debris, and other substances that will support combustion.

Fuel break - a change in fuel continuity, type of fuel, or degree of flammability of fuel in a strategically located strip of land to reduce or hinder the rate of fire spread.

Fuel type - a category of vegetation used to indicate the predominate cover of an area.

Glacial moraine - debris (sand to boulders) transported and deposited by glacial ice along a glacier's sides or terminus.

Graben - a block of earth down dropped between two faults.

Gradient (slope) - a measure of the slope of the land surface.

Ground failure - a general term referring to any type of ground cracking or subsidence, including landslides and liquefaction-induced cracks.

Ground shaking - the shaking or vibration of the ground during an earthquake.

Ground water - that portion of subsurface water which is in the zone of saturation.

Gypsiferous deposits - soil or rock containing gypsum, which can be subject to dissolution.

Gypsum - a mineral composed of hydrated calcium sulfate. A common mineral of evaporates.

Hazard Mitigation Plan - The plan resulting from a systematic evaluation of the nature and extent of vulnerabilities posed by a hazard present in society that includes the strategies needed to minimize future vulnerability to hazards.

Hazard Mitigation - Any action taken to reduce or permanently eliminate the long-term risk to human life and property and the environment posed by a hazard.

HAZUS - Hazard United States. Earthquake Loss estimation software using GIS databases developed by FEMA.

Head (landslide) - the upper parts of the slide material along the contact between the disturbed material and the main scarp.

Holocene - geologic epoch covering the last 10,000 years (after the last Ice Age).

Igneous rocks - rocks formed by cooling and hardening of hot liquid material (magma), including rocks cooled within the earth (for example, granite) and those that cooled at the ground surface as lavas (such as basalt).

Impermeable - materials having a texture that does not permit water to move through.
Intermountain seismic belt - zone of pronounced seismicity, up to 120 miles wide and 800 miles long, extending from Arizona through central Utah to northwestern Montana.

Lacustrine - concerning or pertaining to lakes.

Lake Bonneville - a large, ancient lake that existed 30,000 to 12,000 years ago and covered nearly 20,000 square miles in Utah, Idaho, and Nevada. The lake covered many of Utah's valleys, and was almost 1,000 feet deep in the area of the present Great Salt Lake.

Lake Bonneville sediments - sediments deposited by Lake Bonneville, found in the valleys, which range from gravels and sands to clays.

Landslide - a general term for a mass of earth or rock, which moves down slope by flowing, spreading, sliding, toppling, or falling (see slope failure).

Lateral spread - lateral down slope displacement of soil layers, generally several feet or more, above a liquefied layer.

Levee (flood) - a berm or dike used to contain or direct water, usually without an outlet or spillway.

Liquefaction - sudden large decrease in shear strength of cohesion less soil (generally sand or silt) caused by collapse of soil structure and temporary increase in pore-water pressure during earthquake ground shaking.

Magnitude (earthquake) - a quantity characteristic of the amplitude of the ground motion of an earthquake. The most commonly used measurement is the Richter magnitude scale; a logarithmic scale based on the motion that would be measured by a standard type of seismograph 60 miles from the earthquake's epicenter.

Metamorphic rocks - rocks formed by high temperatures and/or pressures (for example, quartzite formed from sandstone).

Middle Rocky Mountains physiographic province - consists of mountainous terrain of high relief, extending from northern Utah to Wyoming, Idaho, and Montana (includes the Wasatch Range and Uinta Mountains in Utah).

Modified Mercalli intensity (MMI) - the most commonly used intensity scale in the U.S.; it is a measure of the severity of earthquake shaking at a particular site as determined from its effect on the earth's surface, man, and man's structures.

Montmorillonite - a clay mineral characterized by expansion upon wetting and shrinking upon drying.

Natural vegetation - native plant life existing on a piece of land before any form of development.

Normal fault - fault caused by crustal extension in which relative movement on opposite sides is primarily vertical; for example, the Wasatch fault.

Oolite - spherical grains of carbonate sand with a brine shrimp fecal pellet nucleus.
Outlet (dam) - a conduit through which controlled releases can be made from the reservoir.

Peat - unconsolidated surficial deposit of partially decomposed plant remains.

Period (geologic) - a standard (world-wide) geologic time unit.

Permeability - the capacity of a porous rock or soil for transmitting a fluid.

Physiographic province - a region whose pattern of relief features or landforms differs significantly from that of adjacent regions.

Piping (problem soil and rock) - a weak incoherent layer in unconsolidated deposits that acts as a channel directing the movement of water. As the layer becomes saturated it conducts water to a free face (cliff or stream bank for example) that intersects the layer, and material exits out a "pipe" formed in the free face. Piping can occur in a dam as the result of progressive development of internal erosion by seepage.

Pore space - the open spaces in a rock or soil between solid grains. The spaces may be filled with gas (usually air) or liquid (usually water).

Porosity - the ratio of the volume of pore space in rock or soil to the volume of its mass, expressed as percentage.

Probable Maximum Flood (PMF) - a flood that would result from the most severe combination of critical meteorological and hydrologic conditions possible in a region.

Probable Maximum Precipitation (PMP) - the maximum amount and duration of precipitation that can be expected to occur on a drainage basin.
Problem soil and rock - geologic materials that are susceptible to volumetric changes, collapse, subsidence, or other engineering geologic problems.

Project Impact - An initiative of the Federal Emergency Management Agency intended to modify the way in which the United States handles natural disasters. The Goal of Project Impact from a Federal Government perspective is to reduce the personal and economic costs of hazard events by bringing together the private and public sector to better enable the citizens of a community to protect themselves from natural hazards.

Quaternary - a geologic time period covering the last 1.6 million years.

Recurrence interval - the length of time between occurrences of a particular event (an earthquake, for example).

Rock fall- abrupt free fall or down slope movement, such as rolling or sliding, of loosened blocks or boulders from an area of bedrock. The rock-fall run out zone is the area below a rock-fall source, which is at risk from falling rocks.

Rock topple - forward rotation movement of a rock unit(s) about some pivot point.

Run out zone (avalanche) - where a snow avalanche slows down and comes to rest (deposition zone). For large avalanches, the run out zone can include a powder- or windblast zone that extends far beyond the area of snow deposition.

Sand boil (earthquake) - deposit of sandy sediment ejected as water and sand to the surface, formed when ground shaking has caused liquefaction at depth.

Scarp - a relatively steeper slope separating two more gentle slopes. Scarps can form as result of earthquake faulting.

Sediment - material that is in suspension, is being transported, or has been moved from its site of origin by water, ice, or wind, and has come to rest on the earth's surface either above or below the sea level.

Sedimentary rocks - rocks formed from loose sediment such as sand, mud, or gravel deposited by water, ice, or wind, and then hardened into rock (for example, sandstone); or formed by dissolved minerals precipitating out of solution to form rock (for example, tufa).

Seiche - a standing wave generated in a closed body of water such as a lake or reservoir. Ground shaking, tectonic tilting, sub aqueous fault rupture, or landsliding into water can all generate a seiche.

Seismic waves - vibrations in the earth produced during earthquakes.

Seismicity - seismic or earthquake activity.

Sensitive clay - clay soil that experiences a particularly large loss of strength when disturbed. Deposits of sensitive clay are subject to failure during earthquake ground shaking.

Shear strength - the internal resistance that tends to prevent adjacent parts of a solid from "shearing" or sliding past one another parallel to the plane of contact. It is measured by the maximum shear stress that can be sustained without failure.

Shear stress - a stress causing adjacent parts of a solid to slide past one another parallel to the plane of contact.

Slope failure - a general term referring to any type of natural ground movement on a sloping surface (see landslide).

Slump - a slope failure that slides along a concave rupture surface. Generally slumps do not move very far from the source area.

Snow avalanche - a rapid down slope movement of a mass of snow, ice, and debris.

Stafford Act Robert T. Stafford Disaster Relief and emergency Assistance Act, PL 100-707, signed into law November 23 1988: amended the Disaster Relief Act of 1974, PL 93-288

Starting zone (avalanche) - where the unstable snow or ice breaks loose and starts to slide.
Subsidence - a settling or sinking of the earth's crust.

Surface fault rupture (surface faulting) - propagation of an earthquake-generated fault rupture to the ground surface, displacing the surface and forming a scarp.

Tectonic subsidence - subsidence (down dropping) and tilting of a basin on the down dropped side of a fault during an earthquake.

Toe (landslide) - the margin of disturbed material most distant from the main scarp.

Track (avalanche) - the slope or channel down which a snow avalanche moves at a fairly uniform speed.

Unconsolidated basin fill - uncemented and nonindurated sediment, chiefly clay, silt, sand, and gravel, deposited in basins.

Urban area - a geographical area, usually of incorporated land, covered predominately by engineered structures including homes, schools, commercial buildings, service facilities, and recreational facilities.

Urban/Wildland Interface (Urwin) - a geographical area where two different environments, wildland and urban residential, meet and affect each other.

Velocity (ground motion) - the rate of displacement of an earth particle caused by passage of a seismic wave.

Wasatch fault - a normal fault that extends over 200 miles from Malad City, Idaho to Fayette, Utah, and trends along the western front of the Wasatch Range.

Watershed - the area of land above a reference point on a stream or river, which contributes runoff to that stream.

Weathering - a group of processes (such as the chemical action of air, rain water, plants, and bacteria and the mechanical action of temperature changes) whereby rocks on exposure to the weather change in character, decay, and finally crumble into soil.

Wildfire - uncontrolled fire burning in vegetation.

Wildland area - a geographical area of unincorporated land covered predominately by natural vegetation.

Wildland Urban Interface - Wildland vegetation and forested areas adjacent to or intermingled with residential developments.

Zone of deformation (earthquake) - the width of the area of surface faulting over which earth materials have been disturbed by fault rupture, tilting, or subsidence.

List of Acronyms and Recognized Abbreviations

AGRC	Automated Geographic Reference Center
AOG	Association of Governments
Assoc.	Association
ATV	All Terrain Vehicle
Bldg.	Building
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
Bur.	Bureau
CEM	Comprehensive Emergency Management
Corp.	Corporation
CRS	Community Rating System
Dept.	Department
DESHS	Division of Emergency Services and Homeland Security
Div	Division
DMA 2000	Disaster Mitigation Act of 2000
DOT	Department of Transportation
DNR	Division of Natural Resources
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
ESRI	Environmental Systems Research Institute
FEMA	Federal Emergency Management Agency
FFSL	Forestry Fire and State Lands
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FS	Forest Service

GIS	Geographic Information Systems
HAZMAT	Hazardous Materials
HAZUS MH	Hazards United States
ICS	Incident Command System
LEPC	Local Emergency Planning Committee
MSL	Mean Sea Level
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
OSHA	Occupational Safety and Health Administration
PDM	Pre-Disaster Mitigation
PDSI	Palmer Drought Severity Index
SCS	Soil Conservation Service
SEUALG	Southeastern Utah Association of Local Governments
SLC	Salt Lake City
SPI	Standardized Precipitation Index
SWSI	Surface Water Supply Index
UGS	Utah Geological Survey
URWIN	Urban-Rural Wildland Interface Zone
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
UT.	Utah
WFRC	Wasatch Front Regional Council

Appendix J

National Flood Insurance Policy

Most of the known floodplain areas in the United States have been mapped by Federal Emergency Management Agency, which administers the National Flood Insurance Policy (NFIP). The NFIP gathers flood risk data for specific water-courses, lakes, and coastal flood hazard areas, maps, and causes of flooding within a community. This information is compiled into a Flood Insurance Study that designates special flood hazards areas, flood risk zones and establishes base flood elevations (State and Local Mitigation Planning 2-12).

National Flood Insurance Status for Six County Association of Local Governments is as follows.

Table J-1: National Flood Insurance Status

FEMA Federal Insurance Administration 8/19/02

County Name	Community Name	Date of Entry	Date of Current Effective Map
Juab	Unincorporated Juab County	Not participating	
Juab	Eureka	3/1/86	3/1/86
Juab	Levan	2/2/84	NSFHA
Juab	Mona	Not participating	
Juab	Nephi	8/5/86	11/4/87
Juab	Rocky Ridge	Not participating	
Millard	Unincorporated Millard County	9/4/87	9/4/87
Millard	Delta	12/09/85	NSFHA
Millard	Fillmore	11/5/85	NSFHA
Millard	Hinckley	11/30/83	NSFHA
Millard	Holden	3/1/86	3/1/86
Millard	Kanosh	12/11/85	NSFHA
Millard	Leamington	9/4/87	9/4/87
Millard	Lynndyl	Not participating	
Millard	Meadow	7/2/76	7/2/77*
Millard	Oak City	2/2/84	NSFHA
Millard	Scipio	2/2/84	NSFHA
Piute	Unincorporated Piute County	3/18/86	3/18/86
Piute	Circleville	1/30/84	NSFHA
Piute	Junction	1/16/87	1/16/87
Piute	Kingston	2/4/77	2/4/78*
Piute	Marysvale	2/5/86	2/5/86
Sanpete	Unincorporated Sanpete County	6/1/86	6/1/86
Sanpete	Centerfield	Not participating	
Sanpete	Ephraim	4/3/87	4/3/87
Sanpete	Fairview	2/1/87	2/1/87
Sanpete	Fayette	Not participating	
Sanpete	Fountain Green	Not participating	
Sanpete	Gunnison	1/30/84	NSFHA
Sanpete	Manti	8/4/87	8/4/87

Table J-1: National Flood Insurance Status **FEMA Federal Insurance Administration 8/19/02**			
County Name	**Community Name**	**Date of Entry**	**Date of Current Effective Map**
Sanpete	Mayfield	5/28/76	5/28/77*
Sanpete	Moroni	8/5/80	8/5/80
Sanpete	Mt. Pleasant	9/24/84	9/24/84
Sanpete	Spring City	8/5/80	8/5/80
Sanpete	Sterling	Not participating	
Sanpete	Wales	Not participating	
Sevier	Unincorporated Sevier County	7/1/86	9/7/98
Sevier	Annabella	10/30/79	10/30/79
Sevier	Aurora	12/4/79	1/12/82
Sevier	Elsinore	8/14/79	4/6/98
Sevier	Glenwood	7/1/86	7/186
Sevier	Joseph	8/28/79	6/2/95
Sevier	Koosharem	2/2/84	NSFHA
Sevier	Monroe	7/24/79	7/24/79
Sevier	Redmond	11/30/83	NSFHA
Sevier	Richfield	9/29/86	9/29/86
Sevier	Salina	9/29/86	9/29/86
Sevier	Sigurd	1/1/86	1/1/86
Wayne	Unincorporated Wayne County	Not participating	
Wayne	Bicknell	1/30/84	NSFHA
Wayne	Hanksville	Not participating	
Wayne	Loa	12/20/74	12/20/74*
Wayne	Lyman	Not participating	
Wayne	Torrey	6/18/86	NSFHA

* Areas which have had special flood hazard areas identified but are not in the program

The 100-year flood designation applies to the area that has an average 1 percent chance of flooding in any given year. Note that a 100-year flood could occur once every ten years or even two years in a row (2-12).

Base Flood Elevation (BFE) is the elevation of the water surface resulting from a flood that has a 1% chance of being flooded in any given year (100-year floodplain). The BFE is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum of 1988, or other datum referenced in the FIS report (2-12).

The Special Flood Hazard Area (SFHA) is the shaded area on a FIRM that identifies an area that has a 1% chance of being flooded in any given year (100-year floodplain) (2-12).
Floodway is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without raising the water surface elevation by more than one foot.

The level or depth of flooding is determined by the probability. The probability of a flood is based on a statistical chance of a particular size flood occurring in any given year. The percent annual chance of floods is estimated based on watershed and climatic characteristics or watershed models, water surface elevation, and hydraulic models that reflect topographic characteristics. Flood frequencies can be determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size may occur (2-12).

Appendix K

Promulgation Letter/Resolution

This appendix delineates the promulgation letter that was disseminated to the six counties and the 48 incorporated communities. The following is a sample of the Resolution:

RESOLUTION
FOR
PRE-DISASTER MITIGATION PLAN

WHEREAS - The Federal Emergency Management Agency (FEMA) has determined that mitigating natural disasters is more cost-effective than responding to them;

and

WHEREAS - Per a new federal law, Local governments now have to plan for ways to reduce the impacts of natural disasters in order to be eligible for certain types of federal disaster assistance;

and

WHEREAS - This Six County Pre-Disaster Mitigation Plan meets the goal of mitigating natural disasters in the Six County Association of Governments (SCAOG) region;

and

WHEREAS - The Community of ______________ is a member of the SCAOG, and established rural consortium, participating as the Six County Pre-Disaster Mitigation Planning Team Leader and accepts the challenge to implement this plan to properly mitigate natural disasters;

NOW THEREFORE - Be it resolved that the community of ______________accepts the Six County Association of Governments Pre-Disaster Mitigation Plan as it relates to them in lessening the impact of future natural disasters.

Name: ______________________________________ **Title:** Mayor

Signature:____________________________________ **Date:**_______

Appendix L

Economy and Land Use Information

According to the Utah State Department of Workforce Services 1998 employment figures, the District has a workforce of 23, 827. The industrial sectors of government, trade, services, and agriculture are the top four employers in the Region. They employ 75 percent of the workforce or 17,870 employees. To view the employment of all industrial sectors of the Six County area, *see Table 2, Industrial Sectors and Employment.*

Table 2 - Industrial Sectors and Employment

County	Mining	Construction	Manufacturing	TCPU	Trade	FIRE	Services	Government	Ag.
Juab	22	98	370	54	687	31	585	621	285
Millard	101	74	220	589	915	59	620	1019	967
Piute	0	1	2	39	30	6	7	141	154
Sanpete	8	395	1059	261	1316	153	951	2364	997
Sevier	331	383	579	604	1862	138	1387	1556	567
Wayne	0	69	32	18	236	11	320	286	247
Total	462	1020	2262	1565	5046	398	3870	5987	3217
Percent	1.9%	4.3%	9.5%	6.6%	21.2%	1.7%	16.2%	25.1%	13.5%

Source: Utah Department of Workforce Services, Workforce Information

A brief explanation of each industrial sector follows. This includes a summary of historical, present, and future impacts these industries have on employment within the District**.** See *Figure 4, Employment by Industry: Historical & Projected*

The government services sector is the largest employer in the Region. This sector includes public land agencies, federal, state, and local governments and education. This industry currently employs 5,987 or 25 percent of the region's workforce. This compares to 3,917 or 22 percent in 1980, which equates to an annual growth rate of two percent over the past 20 years. It is projected that by 2020 government employment will reach 8,521 or 24 percent slowing annually to 1.5 percent. The government services sector continues to serve as the single strongest employment provider within the region. See *Figure 4, Employment by Industry: Historical & Projected*

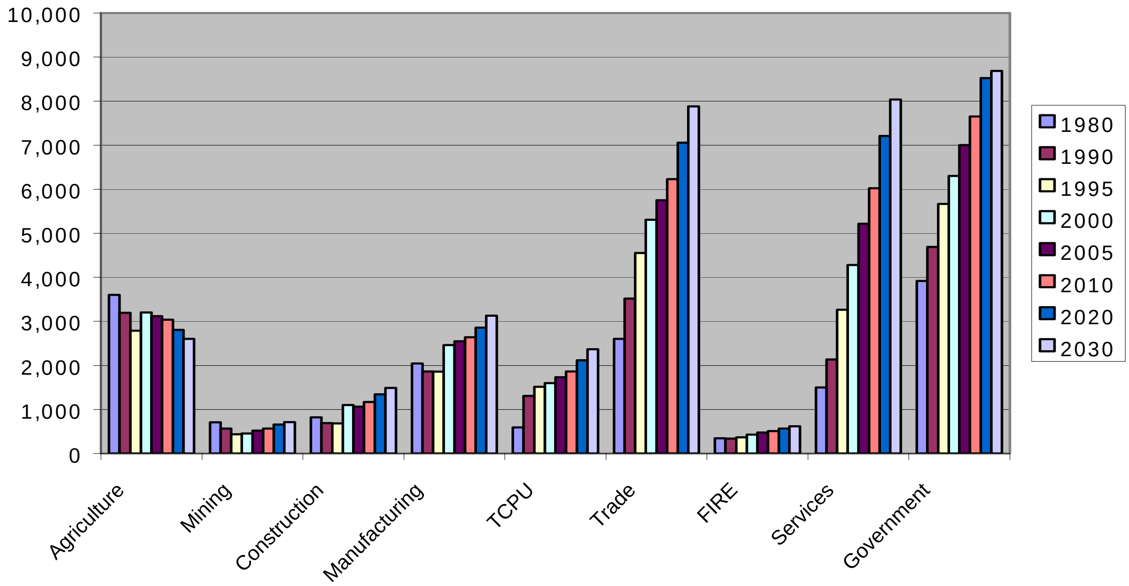
The trade sector currently employees 5,046 or 21 percent of the region's workforce. This sector includes nearly all economic activity involved in retail or wholesale buying and selling. Historically, the trade industry employed 2,605 or 14 percent in 1980 equating to an annual growth rate of three percent over the past 20 years. The next two decades will see the trade industry increase to 7,060 or 20 percent. Annual growth rate is projected at 1.5 percent. See *Figure 4, Employment by Industry: Historical & Projected*

<u>The service sector</u> includes a diverse group of industries including such establishments as hotels and motels, laundries, photo studios, shoe repairs, advertising, building maintenance, computer processing, auto repair, theaters, recreation, health services, engineering, accounting, etc. This industry is largely impacted by the Region's growth. Currently this sector employs 3,870 or 16 percent of the workforce. In 1980 the service industry employed 1,502 or eight percent. This equates to an annual growth rate of five percent. By 2020 it is anticipated that employment in the services industry will increase to 7,208 or 11 percent with annual growth of four percent. Additionally, the increase of tourism has greatly influenced growth in the *trade* and *service* employment sector. According to "Transient Room Tax" data, tourism has grown from $88,140 in 1980 to $399,387 in 1998 equating to a 78% percent increase or four and one third percent annual growth. The annual growth rate is four percent for tourism. The service sector is the fastest growing industry within the District**.** *See Figure 4, Employment by Industry: Historical & Projected*

<u>The agricultural sector</u> was traditionally the major employer of the area. It includes seed production, sheep/wool, turkeys, hogs, beef, dairy farming, poultry, crop harvesting, etc. Over the past 30 years, agricultural employment has steadily declined. In 1980 agriculture employed 3,599 or 20 percent of the workforce. In 1998 this number decreased to 3,204 or 12 percent. It is anticipated this trend will continue with employment declining to 2,808 or just eight percent of the workforce in 2020. This equates to an annual decrease of one and one half percent, the largest decline of any sector within the region. See *Figure 4, Employment by Industry: Historical & Projected*

<u>The mining, construction, manufacturing, transportation/communications/utilities (TCU), finance/insurance/real estate (FIRE) sectors</u> make up the remaining 24 percent of the workforce or 5,707 employees. In 1980 these sectors employed 3,925 or 21 percent. Employment in these industries is anticipated to reach 10,429 or 30 percent of the workforce in 2020. The TCU sector will increase by 52 percent while manufacturing and construction is anticipated to grow by 22 percent and 18 percent respectively. Over the next 20 years, mining and FIRE both show an average of one and one half percent annual increase to 1,230 employees in these two sectors. See *Figure 4, Employment by Industry: Historical & Projected*

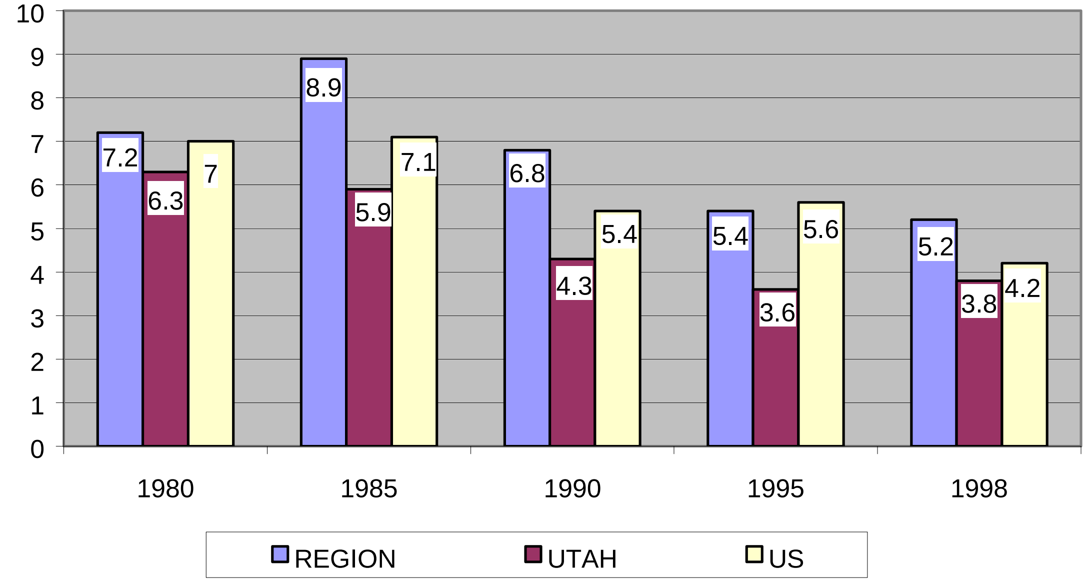
Figure 4: Employment by Industry: Historical & Projected



Source: Dept. of Workforce Services / Governor's Office of Planning and Budget--Demographic and Economic Analysis Section UPED Model System

Unemployment continues to be higher in the District when compared to State and national averages. Over the past two decades, the Region has experienced an average unemployment rate of 6.5 percent compared with the State's 4.7 percent and the national's 5.9 percent. To graphically view historical unemployment data comparisons, *see Figure 5, Unemployment Rates (%).* Unemployed and underemployed persons are affected to a greater degree than their employed counter parts all other variables held equal. Unemployed people similar to those on a fixed income often do not have the financial resources needed to accomplish personal post disaster recovery.

Figure 5: Unemployment Rates (%)



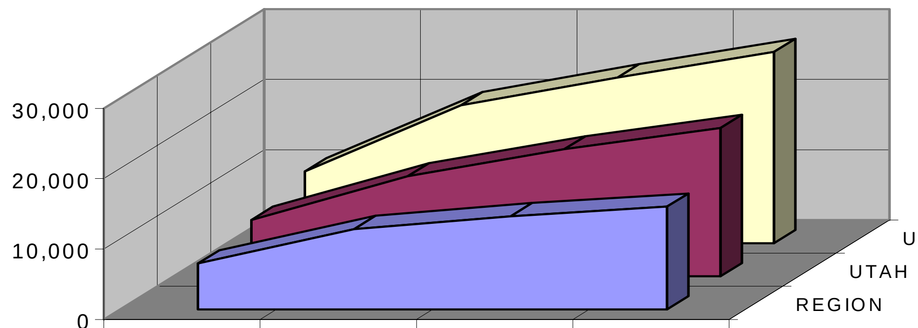
Source: Bureau of Labor Statistics / Utah Dept. of Workforce Services, Workforce Information and Bureau of Census Statistics

A contributing factor to the higher unemployment rate is the development of seasonal employment in the fast growing *trade* and *services* sectors. Additionally, the rural setting of the Six County region makes it difficult to attract an industrial base that is able to provide long-term family sustaining employment.

INCOME LEVELS

Per-capita income among the residents of Central Utah remains significantly lower than that of the state and nation. *Figure 6, Per Capita Personal Income*, graphically compares per capita income data between the Region, State, and nation since 1980.

Figure 6: Per Capita Personal Income



	1980	1990	1995	1998
REGION	6,524	11,430	13,244	14,600
UTAH	8,021	14,213	18,054	21,096
US	10,205	19,614	23,571	27,195

Source: Bureau of Labor Statistics

According to 1998 census data, per capita income in the Six County region is only 69 percent of the State and 57 percent of the nation.

The lower per capita income can be attributed to the willingness of area residents to work for less in order to enjoy a rural life style. This coupled with the fastest growing employment sectors of *trade* and *services* account for the disparity in per capita income. As a result, the area's younger and educated workforce is being forced to locate in larger metropolitan areas in order to secure higher paying employment. Unfortunately, the majorities of jobs for those remaining are lower paying and require relatively no skills.

As this condition becomes more prevalent, many are commuting to take advantage of employment opportunities found in larger metropolitan areas and yet enjoy the rural lifestyle. Unfortunately for many small towns and cities, this dichotomy places a burden on local officials in determining a balance in industrial expansion and residential growth. A further dilemma associated with this movement is the lack of a sustainable tax base necessary to develop infrastructure for new and expanding industry.

LAND UTILIZATION

The Central Utah region is very diverse in nature. Traditional industries, such as farming, ranching, logging and mining all require utilization of both public and private lands. The impact public lands have on the region is relative to the makeup of land ownership in the District. To visually illustrate the current land ownership, in acres, relating to each county *see Table 3 - Land Ownership in Acres.* Counties within the SCAOG cannot be expected to mitigate problems without outside assistance and cooperation from surrounding federal land management agencies. With regards to wildfire much progress has been made by the federal land managers to reduce the wildfire risk to communities within SCAOG, yet much progress needs to be made concerning additional identified natural hazards.

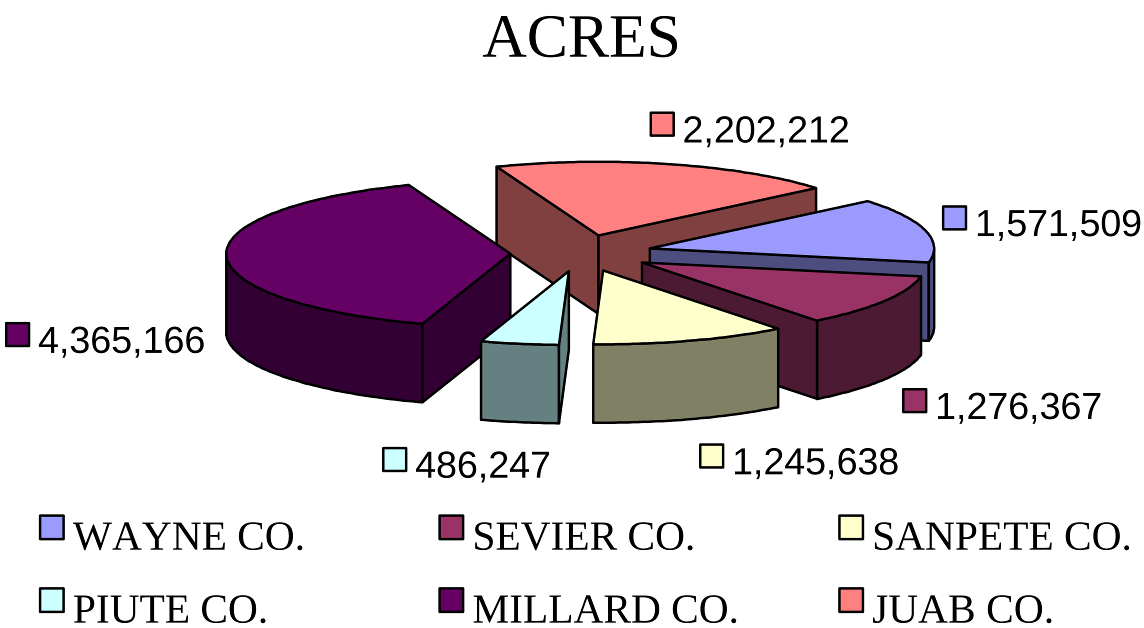
Table 3 – Land Ownership in Acres

	Private	State	BLM*	National Forest*	National Park*
Juab	733,971	128,239	1,503,115	70,319	0
Millard	618,409	379,597	3,028,240	305,315	0
Piute	67,015	60,041	157,537	191,518	0
Sanpete	727,057	51,136	201,239	382,543	0
Sevier	294,902	65,602	263,587	721,634	5,560
Wayne	65,051	140,942	988,739	160,349	139,888
Region Total	2,506,405	825,557	6,142,457	1,831,678	145,448

Source: Utah Facts/BLM/Forest Service/Canyonlands & Capitol Reef National Parks
Note: Areas are GIS Department Estimates as of 1998

The region encompasses a total of 11,147,139 Acres (approx. 16,931 square miles). Currently public lands dominate with Bureau of Land Management (BLM) and United States Forest Service (USFS) controlling 8,057,685 acres or 72 percent of the total acreage. Private ownership equals 1,672,107 acres equating to only 15 percent. State and other interests control 1,564,854 acres or 13 percent. This disparity in land ownership creates a unique and challenging obstacle in economic development. An objective of this mitigation plan is to communicate planning strategies of local officials with public land managers. This includes identifying mitigation activities that protect local communities yet support protection of public lands. The graph in *Figure 10 - Area in Acres* provides a break down and comparison of the area of each county within the region.

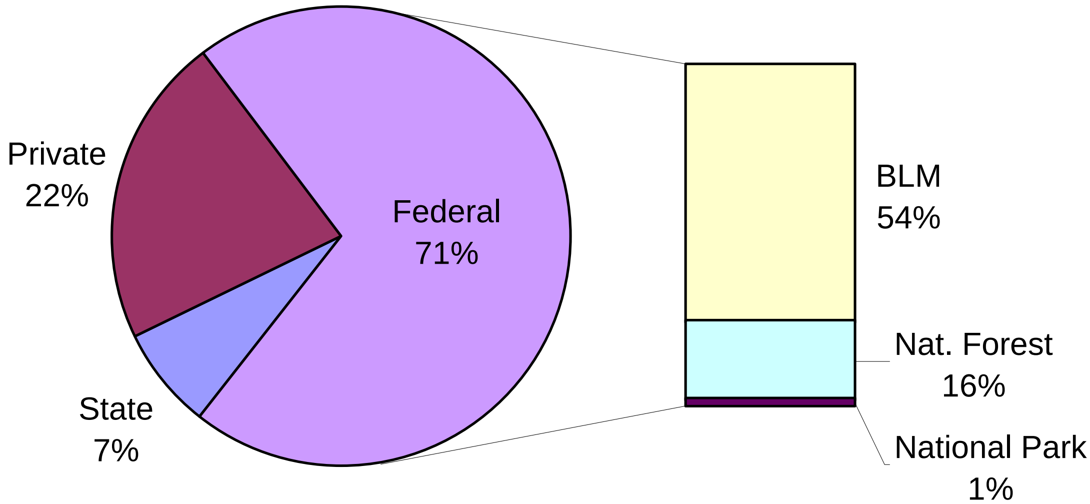
Figure 10 - Area in Acres



Source: U.S. Census Bureau

By comparing the graph with the counties shown on the map in *Figure 1 - Central Utah's Six Counties*, the relationship between acres and county size is evident. It also illustrates the geographical magnitude of the Six County Economic Development District.

Figure 11 – Regional Land Ownership Chart



Source: Utah Facts/BLM/Forest Service/Canyonlands & Capitol Reef National Parks

The Six County Region is rural. Moving from the industrial age to the high technological and innovative age has been slow. However, efforts on both the county and regional levels by key individuals are strengthening the area's economic base.

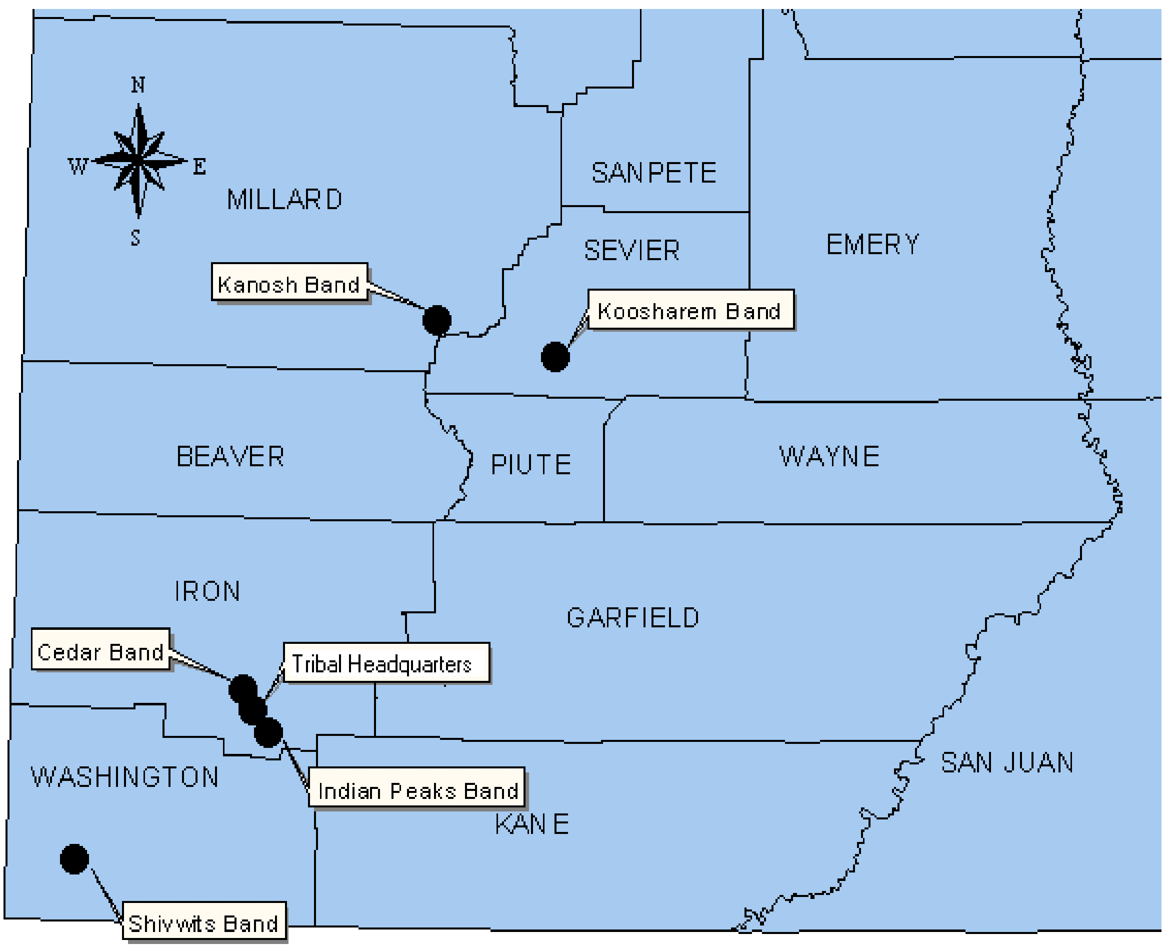
Appendix M

Paiute Indian Tribe of Utah (PITU)

INTRODUCTION

Location - The Tribal headquarters of the PITU is located in Southeastern Iron County approximately 280 miles South of Salt Lake City on Interstate Highway 15, and adjacent to Cedar City. The geographic location of Tribal Headquarters in relation to the five bands are approximately 84 miles from Shivwits, 5 miles from Indian Peaks and Cedar Band, 115 miles from Koosharem, and 105 miles from Kanosh. All are paved roads with good access. Figure 1, PITU Tribal Lands, shows the location of tribal lands in relation to Southern and Central Utah.

Figure 1: **PITU Tribal Lands**



Land Use - Reservation lands of the PITU encompass a total of 32,480 acres. Other than 35 acres of land housing the tribal headquarters and controlled by the Tribal Council, the other 32,445 acres are maintained and controlled by the five tribal bands. Results of a recent economic development survey revealed that tribal members feel their culture and land are their two greatest strengths. The majority of survey respondents felt that preservation of reservation lands was most important with planned industrial and community development.

Band Membership - According to the July 1999 PITU Tribal enrollment there are 741 members. This compares to 516 in 1980. Fifty-seven percent (57%) or 421 members are included in the workforce, which is sufficient to support a sizable business owned and employed by Tribal members. Currently 17% of Tribal members are living outside of the counties encompassing reservation lands. Tribal leadership would like to see improved conditions through economic and community development that would allow members to reside on the reservation. Lack of affordable housing and employment seem to be the major reasons for those leaving and living away from the reservation. Another major concern of Tribal leadership is the loss of heritage and cultural values that are disappearing as a result of members living and working outside of the area.

EMPLOYMENT

Unemployment - The “1997 Indian Labor Report” published by the Department of Interior shows the PITU with a labor force of 421. Of this number, 349 are employed and 72 are unemployed equating to a 17 percent unemployment rate. Of those employed, 239 tribal members or 68 percent are employed below poverty guidelines. Of those employed, 42 or 12 percent work in the public sector while 307 or 88 percent work in the private sector. This compares to a 4 percent average unemployment rate in the eleven county area and 3.4 percent state wide unemployment rate as reported by the September 1999 “Labor Market Report” by the Utah Department of Workforce Services. Table 5, PITU Unemployment compares Tribal member employment with the Five and Six County regions, the State of Utah, and United States.

Table 5 - PITU Unemployment

Entity	Workforce Employed	Workforce Unemployed	Percent Unemployed	Percent in Public	Percent in Private
PITU	**349**	**72**	**17.1**	**12**	**88**
Six County	21,370	936	4.8	12	88
Five County	55,991	2,031	3.5	7	93
State	1,051,600	37,013	3.4	7	93
U.S.	-	-	4.2	-	-

Sources: Utah Labor Market Report, September 1999,Vol. 9, Number 9; Utah Job Outlook - Statewide and Service Delivery Areas 1998-2003, Utah Department of Workforce Services, January 1998

Employment Opportunities - The tribal members were surveyed to determine the economic opportunities they perceived. The most popular choice, by Tribal members was to see resources spent on education and training programs for PITU members. The number one priority for job creation was providing "jobs for those adults who needed to support families". Survey respondents also felt investing tribal resources in well-managed businesses owned and managed by tribal members with good opportunity for return was very important. Light manufacturing, high tech industry, and convenience store development were ranked as the highest perceived economic development opportunities. Agriculture and truck stop development were also mentioned.

INCOME LEVELS

Per-capita income - Per-capita income is the level of income generated by individuals. Per-capita income among the residents of Central and Southern Utah is shown in Table 6, Per-capita Income. The table compares personal income between the counties of Central and Southern Utah in which the majority of PITU members reside.

Table 6 - Per-capita Income

County	1994	1995	1996	1997
Millard	$13,742.00	$14,101.00	$14,806.00	$14,700.00
Sevier	$13,962.00	$14,251.00	$14,965.00	$15,500.00
Beaver	$13,014.00	$13,090.00	$13,359.00	$13,500.00
Iron	$13,329.00	$13,884.00	$14,509.00	$15,300.00
Washington	$15,515.00	$16,348.00	$16,731.00	$17,000.00

(Per Capita Income was taken from the "1999 Economic Report to the Governor: pg. 87").*The Paiute Indian Tribe of Utah lacks Tribal member income status and other related information.

Median/Average Family Income - Another important economic indicator is the income generated by all members of a family household -- living under one roof. This income known as Median/Average Family Income clearly shows the economic vitality of a community by addressing the workforce in general. It references employment levels, signifies strength in education and skills among families. The most recent data for the PITU is 1980. Table 7, Average Family Income shows the average family income for the PITU and its bands.

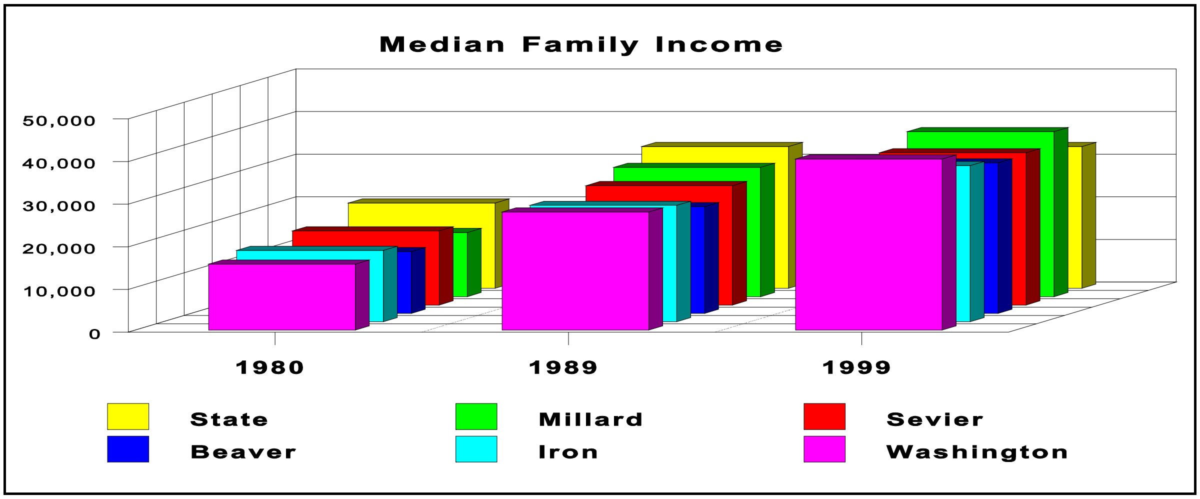
Table 7 - Average Family Income

Band	Average Family Income
Kanosh	$2,914.00
Indian Peaks	$2,774.00
Cedar	$2,215.00
Koosharem	$1,940.00
Shivwits	$3,015.00
Tribal Average	**$2,746.00**

Source: 1980 PITU Reservation Plan

In comparing Table 7, Average Family Income, with Figure 6, Median Family Income it is clear to see that the 1980 income levels for the counties is significantly higher than for the PITU. The graphics of Figure 6 show the trends from 1980 to 1999 for the counties in which the majority of tribal members live. Again because specific data is not available for the tribe a comparison is not made. However, because of the economic disparity in unemployment it is safe to assume the current median family income is much lower for tribal members. Table 8, County Median Family Income, shows the actual income levels of the counties referenced.

Figure 6 - Median Family Income



Source: 1999 Economic Report to the Governor

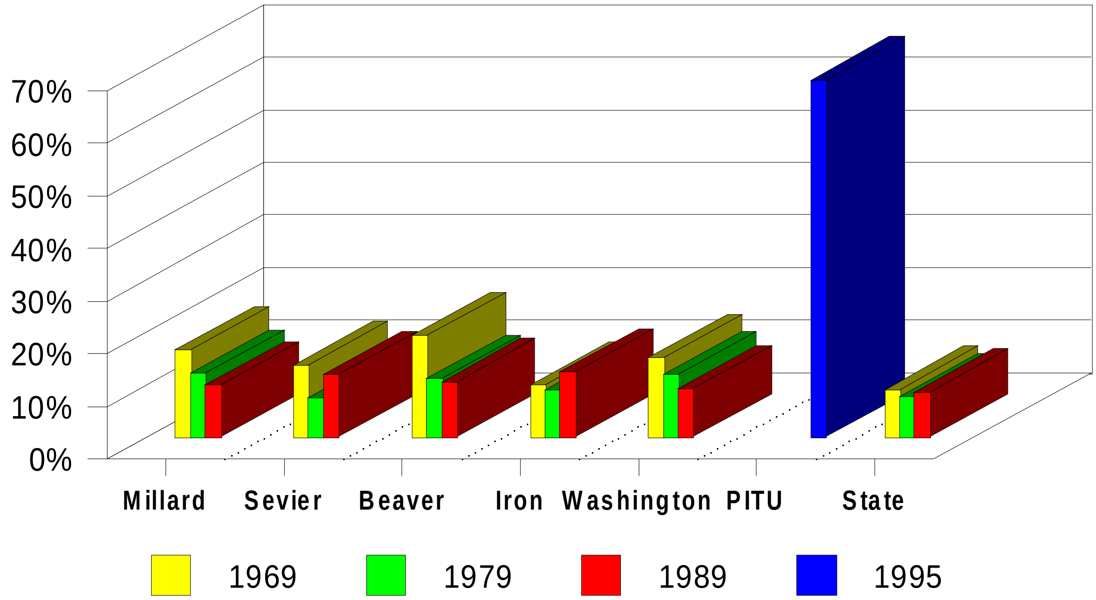
Table 8 - County Median Family Income

County	1980	1989	1999
Millard	$15,038.00	$30,342.00	$38,700.00
Sevier	$17,404.00	$27,986.00	$35,700.00
Beaver	$14,453.00	$25,000.00	$35,300.00
Iron	$16,726.00	$27,283.00	$36,600.00
Washington	$14,466.00	$27,690.00	$40,100.00

Source:1999 Economic Report to the Governor; *The PITU has no records on the Median Family income for Tribal members.

Poverty level - Those living in poverty are of great concern to PITU leadership. Except for 1995, no specific data for the PITU and its bands are available on poverty level. Again it is safe to assume that given the economic distress of unemployment the Tribe is much more vulnerable than their neighboring county residents. Figure 7, Families Below Poverty (%), shows graphically the poverty level trends for Central and Southern Utah between 1969 and 1995. Again, it is believed that the PITU is experiencing a much higher poverty rate than those shown. Table 9, County Poverty Levels (%) shows the actual poverty levels in percent for those counties in which the majority of PITU members reside.

Figure 7 - Families Below Poverty (%)



*1995 PITU data was from the "1997 Indian Labor Force Report," published by the Dept. Of Interior.

Table 9 – County Poverty Levels (%)

County	1969	1979	1989	1995
Millard	16.6	12.1	10.0	14.0
Sevier	13.8	7.4	11.9	14.9
Beaver	19.4	11.2	10.6	13.4
Iron	9.9	9.1	12.4	16.8
Washington	15.2	11.9	9.2	13.3
State	9.1	7.7	8.6	11.4
Paiute Tribe	**-**	**-**	**-**	**68.0**

*Source: 1995 Economic Development & Employer Planning System Ver. Utah 94.4

LAND UTILIZATION

The tribal government of PITU does not control reservation lands. Each of the five constituent bands is responsible for their respective land preservation or development. Needed infrastructure to support community and economic development are the responsibility of each band and supported by Tribal Council of the PITU. Concerns among tribal members include affordable housing, water development, industrial zoning, natural resource use and preservation. A general land use plan for the PITU has been developed. This document should be reviewed to understand current infrastructure and land utilization. Copies of the plan may be reviewed at the Tribal or band headquarters.

Appendix N

Flood Hazard Identification Study
Six County Association of Governments

By:
United States Army Corps of Engineers
Utah Division of Emergency Services and Homeland Security

August 1, 2003

Introduction
The US Army Corps of Engineers Sacramento District completed this flood hazard identification study through a contract with the seven Associations of Governments. Funding was provided under the USACE Planning Assistance to States Program (Section 22). The intent of the study is to aid in detailing natural hazards associated with fluvial process for entities within each AOG currently unmapped as part of the National Flood Insurance Program or mapped as D zone areas.

Acknowledgements
The following agencies aided in preparation, interpretation, and completion of this flood hazard investigation study.

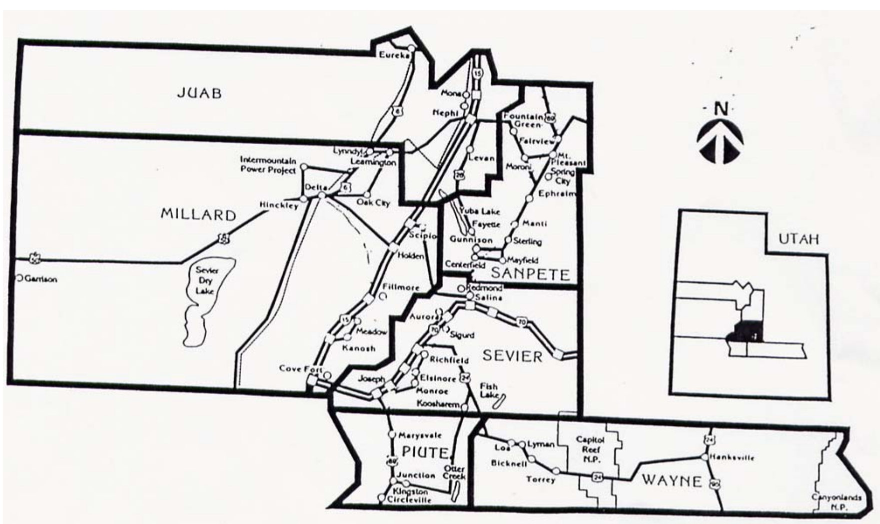
Utah Associations of Governments
Six County Association of Governments
Sacramento District Corps of Engineers
Utah Division of Emergency Services and Homeland Security

Scope of Work
This study will evaluate and identify areas with a high flood hazard and identify potential mitigation solutions. The areas evaluated in this study include the six unincorporated counties of Juab, Millard, Piute, Sanpete, Sevier, and Wayne. Municipalities within the six counties were studied if they met the following criteria:

1. Jurisdiction has not been mapped by FEMA,
2. Jurisdiction mapped by FEMA as a Zone D, area of undetermined flood hazard.

Fluvial hazards within the cities and towns of: Levan, Mona, Rocky Ridge, Lynndyl, Marysvale, Centerfield, Fayette, Fountain Green, Sterling, Wales, Monroe, Salina, Lyman, and Hanksville were studied.

Description of the Study Area



Six County Association of Governments and the counties and municipalities it serves, are comprised of the following counties Juab: population 8,238, Millard: population 12,405, Piute: population 1,435, Sanpete: population 22,763, Sevier: population 18,842, Wayne: population 2,509. The total population of the six counties is 66,192 (Census 2000). Land within Six County is drained by one of three basins: the West Colorado River Basin, Sevier River Basin, or the West Desert Basin. The majority of the land within the six county area drains into the Sevier River Basin. The six county area is subject to periodical floods due to large and/or quick snow melts as well as micro-bursts from spring, summer, and fall rains. The above map illustrates the study area in relation to the state.

Discussion, Data, and Observations

Data presented in this study are from the following sources:

- West Colorado River Basin Plan
- West Desert Basin Plan
- Sevier River Basin Plan
- Manti City Flood Insurance Study
- Elsinore City Flood Insurance Study
- Town of Joseph Flood Insurance Study
- Richfield City Flood Insurance Study
- Salina City Flood Insurance Study
- Sevier River and Tributaries, Utah Reconnaissance Report US Army Corps of Engineers March 1994
- Flood Damage Prevention Study Sevier River Basin Investigation, Utah US Army Corp of Engineers January 1994.

In addition to incorporating existing studies and plans completed in the area, this flood hazard study also contains information from technical experts familiar with the study area. The mitigation projects are purely suggested actions, which based on past experience, will reduce or eliminate the identified fluvial hazard. These mitigation recommendations in no way represent the only measure to attain fluvial mitigation. In many cases the proposed or best solution is simply avoidance. This method of mitigation is implemented through the use of zoning, and represents in most cases the lowest cost mitigation measure.

Disclaimer

The information provided in this study was developed from a number of sources including:

- Past USACE studies done within the region and drainage basins,
- Personal knowledge,
- Limited onsite visits,
- Map interpolations,
- Current GIS work.

Even though care was taken to ensure a measure of correctness and field checks were preformed on the information and data gathered, it is important to note this flood hazard study is presented "as is". The United States Army Corps of Engineers, Division of Emergency Service and Homeland Security, or any other agency assisting in completion of this study cannot accept any responsibilities for errors, omissions, or accuracy. There are no warranties, which accompany this product. Users are cautioned to field verify information provided in this product before making any decisions. In no way does the mapping presented in this study take the place of a regulatory FEMA Flood Insurance Rate Map (FIRM), or replace any flood hazard identification product developed by FEMA / National Flood Insurance Program (NFIP).

How Communities Where Ranked
The communities within this study were ranked based on a committee's evaluation. The evaluation committee consisted of the:

- Utah State Floodplain Program Manager
- Utah State Hazard Mitigation Officer,
- Natural Hazard Mitigation Planner,
- U.S. Army Corp of Engineers,
- State Earthquake Program Manager.

This committee researched each of the twenty-nine counties and all 269 incorporated areas within the State of Utah. Each jurisdiction was assigned one of five ratings: Very High, High, Moderate, Low, or Not Rated. These rating in no way reflect actual flood threat. The ratings were assigned based on the following variables:

- Perceived flood threat based on topography, past flooding occurrences, and experience of committee members.
- Participation in the National Flood Insurance Program (NFIP).
- Past studies included, but not limited to, regulatory FEMA/NFIP Flood Insurance Studies (FIS), other flood studies, and reconnaissance reports.
- Population growth within the jurisdiction.
- If the community is mapped by FEMA/National Flood Insurance Program NFIP), and type of map which identifies high, moderate and low flood threats

Ratings were used to set the scope of work for each community within this study**.** Information on excluded communities was added were available.

A Word about Wildfires
Almost every year several communities around the state are flooded and/or affected by post burn debris flows. Wildfire damaged watersheds have conditions which increase the potential for debris flows which may damage structures and infrastructure in the impacted area. Overall, the heightened risk associated with alluvial fans is always of concern. Post fire re-vegetation and stabilization efforts in many cases do not alleviate the threat due to flooding and debris flow.

A Word About Dams
Dams are a critical support function for water managers in the State and also act as a flood control measure. If a dam remains stable, does not get overtopped, or is not impaired as the result of an earthquake, then, at a minimum, they do provide incidental flood control. If not then they can add to the flood threat. There are 134 dams within Six County of those 26 have received an high hazard rating by Utah Division of Water Rights Dam Safety section. The State Dam Safety Section has developed a hazard rating system for all non-federal dams in Utah. Downstream uses, size, height, volume, and incremental risk/damage assessments are a variable used to assign dam safety classification. Using the hazard ratings systems developed by the State Dam Safety Section, dams are placed into one of three classifications high, moderate, and low. Dams receiving a low rating would have insignificant property loss do to dam failure. Moderate hazard dams would cause significant property loss in the event of a breach. High hazard dams would cause a possible loss of life in the event of a rupture. The frequency of dam inspection is

designated based on hazard rating with the Division of Water Rights inspecting high-hazard dams annually, moderate hazard dams biannually, and low-hazard dams every five years.

Juab County

- Mona
- Sevier Bridge

Millard County

- Corn Creek
- Gunnison Bend
- DMAD

Piute County

- Otter Creek
- Piute
- Upper Beaver Creek
- Lower Beaver Creek

Sanpete County

- Ninemile
- Dairy Dam
- Fairview Lake
- Palisades Lake
- Huntington
- Rolfson
- Gunnison

Sevier County

- Forsyth
- Cottonwood Wash Detention Basin
- Dairy Canyon Detention Basin
- Glenwood Debris
- Johnson
- Rocky Ford
- Three Creeks
- Koosharem
- Sand H Debris

Wayne County

- Mill Meadow

A Word about Prevention and Preparedness

Communities need to pay attention to such things as topography and past flood history when designing and approving new construction. Cities need insure adequate storm drain systems are installed, and paved areas and streets do not intersect stream channels only to become new "rivers". Aged irrigation storage basins and canals represent a risk to down slope property should the canal fail.

Simple things like not storing valuables and keepsakes such as photographs in the basement (or other low lying areas), and raising your furnace, water heater, and electric panel can really lessen the impacts if a flood does occur. Consult with a professional for further information if this and other damage reduction measures can be taken.

Residents need to let their local officials know that flooding and the consequences it brings is a concern to the majority of the citizenry. Wherever a serious problem does exist, citizens could organize themselves, working to reduce or eliminate the flood threats that face the community.

Working together public officials and residents can make a BIG difference as to the outcome BEFORE floods threaten their community.

Juab County

COUNTY	CITY/TOWN	POPULATION	LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Unincorporated Juab County		798		**Not Participating**	Salt, Currant, Tanner & Cherry Creeks & Tribs
Juab	Eureka	766	F4	490079 - 3/1/86(L)	
Juab	**Levan**	688	F4	490080 - **(NSFHA)**	**Moderate flood threat**
Juab	**Mona**	850	F5	**Not Participating**	Minor flood threats from Currant Creek & Mona Reservoir
Juab	Nephi	4733	F5	490229 - 11/4/87	
Juab	**Rocky Ridge**	403	E5	**Not Participating**	Pot. NSFHA Eligible no waterway

Juab County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Juab	July 31, 1936	Eureka/Tintic	Considerable flood damage to roads and streets. Mud covered rail tracks.	
Flood Juab	August 10, 1941	Mona/Jericho	Damaged railroad tracks, property and road network	
Flood Juab	July 21, 1943	Nephi	Property, roads, and bridges damaged	Salt Creek Canyon
Flood Juab	August 15, 1955	Nephi	Business establishments, farms and irrigation ditches. 7,000 turkeys were killed.	Bigelow Canyon Cloudburst

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Juab	August 4 1961	Jericho, Nephi, and Eureka	Utah Highways 11, 36, and 132 and U.S. 6 covered with water and debris	Heavy rains
Flood Juab	July 18, 1964	Eureka	Homes and streets	Worst storm in many years
Flood Juab	July 22, 1968	Tintic	Homes, roads, electric, and telephone lines.	
Flood Juab	August 2, 1968	Levan	City streets and irrigation ditches	Pigeon Creek Canyon over $15,000 in damages
Flood Juab Presidential	1983	Levan and Nephi although problem countywide.	Creek channels filled with sediment, damaged bridges, culverts, roads, water lines	Pigeon, Chicken, and salt, Creeks. Juab county agricultural losses totaled 8 million and public damage totals were 2 million.
Flood Juab Presidential	1984	County Wide	Creek channels filled with sediment, damaged bridges, culverts, roads, water lines	Public assistance total $1,310,566

(All dollar values for given are for year of disaster)

Unincorporated Juab County

Problem Identification:
Less than 10 percent of the county's population lives in unincorporated areas of Juab County. Many live in the area surrounding Nephi. Development should be avoided adjacent to Salt, Currant, Tanner and Cherry Creeks (and their tributaries) where the threat of flooding is present. Principle lakes/reservoirs include Yuba, Mona, and Chicken Creek; of these only Mona reservoir is listed as high hazard.

Objective: Minimize future flood damage in Unincorporated Juab County.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent
(100 ft minimum setback or greater) as well as not allowing development on alluvial fans. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances.

Time Frame:
Funding:
Estimated Cost: Minimal – almost nothing
Staff:

Action: New development near canals should also be discouraged. There have been several potentially deadly flood events in the state due to flooding caused by canal failures.

Time Frame:
Funding:
Estimated Cost: Minimal – almost nothing
Staff:

Eureka

Problem Identification:
Localized inundation occurs following high frequency rain events and snowmelt, due to inadequate storm water management system.

Objective: Minimize future flood damage due to flooding in Eureka

Action: Install curb, gutter and storm drain system in Eureka
Time frame:
Funding:
Estimated Cost:
Staff:

Levan

Problem Identification:
Although designated as a No Special Flood Hazard Area (NSFHA) by FEMA, this community has experienced several significant flood events, most notably in 1968 when an estimated 4,000

cfs came down Pigeon Creek. Flooding in 1983 on both Pigeon and Chicken Creeks were approximately a 50-year event. See attached Wasatch Front Flood Study (WFFS) excerpt.

Objective: Minimize future flood damage in Levan.

Alternative Action: Nonstructural measures such as zoning are likely the most cost effective (see narrative for the county's mitigation above).

> **Time Frame:**
> **Funding:**
> **Estimated Cost:** Minimal – almost nothing.
> **Staff:**

Alternative Structural Action: Potential structural mitigation includes debris basins on both Pigeon and Chicken Creeks and protection of the road and the Town's water line up Chicken Creek Canyon (if not already protected).

> **Time Frame:**
> **Funding:**
> **Estimated Cost:** The total cost structural measures would likely be between \$2.4 million and \$3 million (see attached).
> **Staff:**

Mona

Problem Identification:
Although there is a fairly large watershed east of town, the flood threat to Mona is fairly minimal since it is limited by the capacity of the culverts and underpass on Interstate 15. Currant Creek flows on the west side of town into Mona reservoir but these flooding sources also pose little threat so long as new development is not allowed to build adjacent to them, west of the railroad line.

Objective: Minimize future flood damage in Mona.

Alternative Action: Nonstructural measures such as zoning appear to be the most prudent approach (see narrative for the county's mitigation above) to minimize potential impacts from the eastside drainage, Currant Creek, and Mona Reservoir since the threat is relatively minor. Currant Creek and/or Mona Reservoir should allow no development in the area west of the railroad tracks, which could be flooded

> **Time Frame:**
> **Funding:**
> **Estimated Cost:** Minimal – almost nothing
> **Staff:**

Alternative Action: A structural action could consist of levees along the eastside drainage and constructing a dyke on the west side of town to prevent flooding from Currant Creek and Mona Reservoir.

Time Frame:
Funding:
Estimated Cost: about $400k
Staff:

Rocky Ridge

Problem Identification: Utah's newest town, Rocky Ridge was incorporated only a few years ago. It is located just west of I-15, just south of the Utah/Juab County line. The community sits at the base of a hill amidst several small ravines. However, the contributing watershed above the community is relatively small so the potential for catastrophic flooding is minimal. There exists the potential for a FEMA No Special Flood Hazard Area (NSFHA) designation. It appears that the east/west streets may have been intentionally located at the ends of these ravines to handle some storm water runoff. For the majority of rainfall events, this will be adequate. A few homes near the mouths of the ravines may be at more substantial risk.

Objective: Minimize future flood damage in Rocky Ridge.

Action: New homes/structures should be sited so as to be away from the streets and low points. Efforts to evaluate these homes and flood proof as needed would be advisable.

Time Frame:
Funding:
Estimated Cost: Minimal
Staff:

Millard County

COUNTY	CITY/TOWN	POPULATION	LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Unincorporated Millard County		3815		490233 - 9/4/87	**Index panel only – All Zone D**
Millard	Delta	3209	G3	490206 - (NSFHA)	
Millard	Fillmore	2253	G4	490087 - (NSFHA)	
Millard	Hinckley	698	G3	490200 - (NSFHA)	
Millard	Holden	400	G4	490201 - 3/1/86(L)	
Millard	Kanosh	485	H4	490088 - (NSFHA)	
Millard	Leamington	217	F4	490246 - 9/4/87	
Millard	**Lynndyl**	134	F4	**Not Participating**	**NSFHA Eligible – no waterway**
Millard	Meadow	254	H4	490089NITP - 7/2/76	
Millard	Oak City	650	G4	490090 - (NSFHA)	
Millard	Scipio	290	G4	490091 - (NSFHA)	

Millard County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Dam Failure Millard	June 23, 1983	Near Delta DMAD	Unknown	16,000 acre feet of water inundated the town of Deseret killing one person.
Flood Millard	1896	Meadow	Unknown	Unknown
Flood Millard	1934	Meadow	Unknown	Unknown
Flood Millard	1938	Meadow	Unknown	Unknown

Flood Millard	1940	Meadow	Unknown	Unknown
Flood Millard	August 4-6, 1945	Oak City	Homes and fields in Oak City	Dry Creek and Oak Creek drainages
Flood Millard	July 18, 1951	Scipio	Damage to farms, crops, and residential areas	$25,000.00 in damages
Flood Millard	August 25, 1958	Scipio	Damage to farmlands and Highway 63	$3,000.00 in damages
Flood Millard	July 31, 1961	Fillmore	City homes and water lines	Chalk Creek Chalk Creek
Flood Millard Presidential	1983	Fillmore, Deseret, and Scipio	Loss of over 140 homes, rail lines, sewer lines, roads, etc.	Chalk Creek, Oak Creek, and the Sevier River. 1 million in public assistance.
Flood Millard Presidential	1984	County wide	All sectors	Public assistance total $492,204.
Flood Millard	August 2000	Holden	Damage to 4 structures and municipal roadways.	Unknown

(All dollar values for given are for year of disaster)

Unincorporated Millard County

Problem Identification:
About 30 percent of the Millard County's population lives in unincorporated areas of the county. Many live in the areas surrounding Delta and Fillmore. Development should be avoided adjacent to Sevier and Beaver Rivers (and their tributaries) where the threat of flooding is greatest. Unincorporated Millard County has a FEMA designation of Zone D, "Areas of undetermined but possible flood hazards". Principle Lakes/Reservoirs include DMAD, Fool Creek, Clear Lake, and Gunnison Bend, Scipio, and Sevier (Dry) Lake.

Objective: Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances.

Time Frame:
Funding:
Estimated Cost: Minimal – almost nothing**.**
Staff:

Lynndyl

Problem Identification: This community is situated on a plateau well above and away from the Sevier River floodplain. It is definitely eligible for a FEMA No Special Flood Hazard Area designation.

Objective: Officially recognize Lynndyl as a NSFHA

Action: Draft and adopt a NSFHA ordinance
Time Frame:
Funding:
Estimated Cost: Minimal
Staff:

Fillmore

Problem Identification: Chalk Creek at Fillmore has a drainage area of about 67 square miles. The creek channel is highly incised through much of the community. Structural inventory taken in 1994 indicates as many as 90 structures could be vulnerable to flooding. Vulnerable structures are primarily located where Chalk Creek crosses Highway 99 and downstream to I-15.

Objective: Reduce flood threat from Chalk Creek within Fillmore City

Action: Maintain and improve existing levee along Chalk Creek
Time Frame:
Funding:
Estimated Cost: Minimal
Staff:
Background: Flatten the side slopes, filling in depressions and rodent holes, and removing any deep-rooted plants along the levee. Fill and protect locations where the levee is eroded with riprap or other armoring.

Action: Add a levee or floodwall upstream from Highway 91 to prevent breakout flows
Time Frame:
Funding:

Estimated Cost: Minimal
Staff:

Action: Maintenance of channels and bridge openings
Time Frame:
Funding:
Estimated Cost: Minimal
Staff:
Background: Keep all bridge openings and upstream channels free of debris to prevent constriction during high flows.

Action: Initiate floodplain-mapping study to determine whether a flood threat does exist.
Time Frame:
Funding:
Estimated Cost: Minimal
Staff:
Background: Fillmore has a FEMA No Special Flood Hazard Areas (NSFHA) designation.

Action: Advise residents of the availability of flood insurance.
Time Frame:
Funding:
Estimated Cost: Minimal
Staff:
Background: Inform residents adjacent to the channel of the potential risk of flooding and advise them flood insurance is available. Because of Fillmore's designation flood insurance is priced very reasonable.

*Fillmore mitigation recommendations from Sevier River and Tributaries, Utah Reconnaissance Report prepared by the US Army Corp or Engineers Sacramento District March 1994.

Piute County

COUNTY	CITY/TOWN	POPULATION	LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Unincorporated Piute County		230		490094 - 3/18/86(M)	Minor Threat
Piute	Circleville	505	I4	490095 - (NSFHA)	Minor Threat
Piute	Junction	177	I4	490096 - 1/16/87	Minor Threat
Piute	Kingston	142	I4	490087NITP - 2/4/77	Minor Threat
Piute	**Marysvale**	381	H4	490098 - 2/5/86(M)	High threat from Bullion Creek & others.

Piute County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Piute	July 7, 1949	Marysvale	Extensive flood damage to highway in Marysvale Canyon.	
Flood Piute	July 18, 1965	Marysvale	U.S. 89 damaged	
Flood Piute	August 6, 1967	Kingston	Highway 22 damaged	Source Kingston Canyon
Flood Piute	July 24, 1968	Marysvale	Damage to homes, crops, and U.S. 89.	
Flood Piute Presidential	1983	Marysvale	Damaged roads, bridges, culverts, and agricultural interests.	Source: Kingston, Bullion, and Cottonwood Canyons.
Flood Piute	August 22, 1997	Kingston Canyon	Damage to roads, waterlines, and stream channel	Source Monsoonal thunderstorm in Kinston Canyon

(All dollar values for given are for year of disaster)

Unincorporated Piute County

Problem Identification:
Only about 16 percent of the county's population lives in unincorporated areas of the county. Development should be avoided adjacent to Sevier River and Otter Creek (and their tributaries) where the threat of flooding is greatest. The FEMA Piute County FIRMs identify most areas as Zones C or X (little to no flood threat) with the areas adjacent to the rivers and creeks identified as Zone A – 100 year flood risk. The State Division of Water Resources, Dam Safety Section indicates there are four high hazard dams within Piute County. Although Piute County is small in both area and population size standards the majority of population lives below and within about thirty miles of the Otter Creek or Piute Dams both of which are considered high hazard.

Objective: Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population, which will oppose any zoning or other changes in the regulations and ordinances.

Time Frame:
Funding:
Estimated Cost: Minimal – almost nothing
Staff:

Municipalities: Three of the 4 incorporated communities in Piute County - Circleville, Junction, and Kingston. The three identified have a relatively minor risk of flooding from the Sevier River and it's tributaries. Marysvale, however, has an extensive history of flooding.

Marysvale

Problem Identification: has an extensive history of flooding from Bullion (Pine) Creek and a high future flood threat - even greater than that shown on the FEMA map (see attached). The 100-year flow has been estimated at almost 900 cfs. There are also smaller threats from Beaver Creek on the north side of town and California Gulch through the center of town.

Objective: Minimize future flood damage in Marysvale.

Action: Construct a detention basin on Bullion Creek if a suitable site can be identified.

Time Frame:
Funding:
Estimated Cost: $300k
Staff:

Sanpete County

COUNTY	CITY/TOWN	POPULATION	LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Unincorporated Sanpete Co.		3650		490111 - 6/1/86(L)	
Sanpete	**Centerfield**	1048	G5	**Not Participating**	NSFHA Eligible – no waterway
Sanpete	Ephraim	4505	G5	490112B - 4/3/87(M)	
Sanpete	Fairview	1160	F5	490113A - 2/1/87(L)	
Sanpete	**Fayette**	204	G4	**Not Participating**	Moderate threat from eastside drainages
Sanpete	**Fountain Green**	945	F5	**Not Participating**	Major threat from Westside drainages
Sanpete	Gunnison	2394	G5	490115 - (NSFHA)	
Sanpete	Manti	3040	G5	490116 - 8/4/87	
Sanpete	Mayfield	420	G5	490117 - NITP	
Sanpete	Moroni	1280	F5	490118 - 8/5/80(M)	
Sanpete	Mt Pleasant	2707	F5	490213 - 9/24/84(M)	
Sanpete	Spring City	956	F5	490119 - 8/5/80(M)	
Sanpete	**Sterling**	235	G5	**Not Participating**	Little threat to development – creek is located in a deep ravine
Sanpete	**Wales**	219	F5	**Not Participating**	Limited flood threat – south end only

Sanpete County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Sanpete	July 24, 1946	Mount Pleasant	Devastated city damaging homes, businesses, railroad tracks, water lines, livestock, and streets	$500,000 in damage. Flood originated from Mount Pleasant Canyon.
Flood Sanpete	August 7, 1952	Mount Pleasant	Irrigation systems and farmlands	$10,000 dollars in damage. Flooding from Birch Creek and North Creek
Flood Sanpete	July 30, 1956	Manti	Farms, irrigation canals, and roads.	Willow Creek
Flood Sanpete	August 5, 1961	Fountain Green	Farmlands, crops, and fish hatchery.	$31,000 in damage. Flood from Tidds and Log Canyons
Flood Sanpete	July 17-19, 1965	Ephraim	Damage to roads, canals, and a flood control dam.	Willow Creek
Flood Sanpete	July 31, 1965	Mount Pleasant/Wales/ Spring City	Roads and culinary water system	$10,000 in damage. Pleasant Creek and Twin Creek.

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Sanpete Presidential	1983	Centerfield, Ephraim, Fairview, Fountain Green, Gunnison, Manti, Mayfield, Moroni, Mount Pleasant, Sterling, and Spring City.	All sectors impacted by event loss to road, culverts, agriculture, sewer, infrastructure, flood controls, etc.	Source Twelve-mile, Cottonwood, Creeks, Pole Gamit, and Log Canyons, Peacock springs, San Pitch River. Public road damage amounted to $650,000.
Flood Sanpete Presidential	1984	County wide	All sectors impacted by event loss to road, culverts, agriculture, sewer, infrastructure, flood controls, etc.	Public assistance totals $1,382,136.
Flood Sanpete	July 22, 1998	Spring City	Damage to road, bridges, water supply, diversion structures, and 12 homes.	$2.5 million est. damage from Canal and Oak Creeks.

(All dollar values for given are for year of disaster)

Unincorporated Sanpete County

Problem Identification: Only about 16 percent of this county's population lives in unincorporated areas of the county. Development should be avoided adjacent to the Sevier and San Pitch Rivers (and their tributaries) where the threat of flooding is greatest. The FEMA FIRMs identify most areas as Zones C and X (little to no flood threat) with the areas adjacent to the rivers and creeks identified as Zone A – 100 year flood risk. Lakes/Reservoirs include Sevier Bridge, Gunnison, Palisade, and Ferron.

Objective: Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. Oppose any zoning or other changes in the cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances.

Time Frame:
Funding:
Estimated Cost: Minimal – almost no cost.
Staff:

Centerfield

Problem Identification: This community should be considered a No Special Flood Hazard Area (NSFHA) – eligible community, as there are NO rivers or creeks in the area.

Objective: Officially recognize Centerfield as a NSFHA

Action: Draft and adopt a NSFHA ordinance
Timeframe:
Funding:
Estimated Cost: Minimal
Staff:

Fayette

Problem Identification: Only a relatively minor flood threat exists from the very small eastside drainages. Also, there is a minimal threat from the Fayette Canal and Sevier Bridge Reservoir (Yuba Lake).

Objective: Minimize future flood damage in Fayette.

Alternative Action: As with similar small communities, the relatively low threat of flooding indicates that nonstructural zoning is preferable to structural measures unless an historic flood problem is known to exist (see discussion on zoning in the County's mitigation section above).

Time Frame:
Funding:
Estimated Cost:
Staff:

Alternative Action: A potentially viable alternative would be to flood proof those existing low-lying structures that are subject to flooding.

Time Frame:
Funding:
Estimated Cost: \$10k-\$30k per structure
Staff:

Fountain Green

Problem Identification: Major threat from drainages on the west and to a lesser extent from the north. Actions should be identified to warn residents of the substantial flood threat.

Objective: Minimize future flood damage in Fountain Green.

Alternative Action: Some form of structural mitigation on Uinta/Gammett and Fountain Green Creeks is needed. Levees or berms could be constructed on the creeks. It would require about 20,000 ft of levee as shown on the attached map.

Timeframe: Based on funding
Funding:
Estimated Cost: It would cost about \$50 per lf or approximately \$1 million total.
Staff:

Alternative Action: A potentially viable alternative would be to flood proof those existing low-lying structures that are subject to flooding.

Timeframe: Based on funding
Funding:
Estimated Cost: \$10k - \$30k per structure
Staff:

Sterling

Problem Identification: There is little threat to development. Sixmile Creek is located in a deep ravine on the north side of town. The upstream Palisade Reservoir also provides some incidental flood control to the community.

Objective: Minimize future flood damage in Sterling

Action: It appears that the most prudent mitigation is zoning to prevent development in the ravine.

Timeframe: Based on funding
Funding:
Estimated Cost: Minimal – almost nothing.
Staff:

Wales

Problem Identification: Limited flood threat – south end only from Wales Canyon Creek.

Objective: Minimize future flood damage in Wales

Alternative Action: A short levee stretch would reduce what flood threat there is. The single levee on the north is approximately 3,000 ft.

Timeframe:
Funding:
Estimated Cost: About $150,000 (or double that if levee protection is desired on both sides).
Staff:

Alternative Action: An alternative to a levee would be to flood proof the few vulnerable structures.

Timeframe:
Funding:
Estimated Cost: $10 - $30 per structure
Staff:

Multi-Jurisdictional Flood Threats

Problem Identification: Residential areas of Ephraim, Spring City, Mt. Pleasant, and Manti experienced residential flooding in areas due to Canal Creek in 1998.

Objective: Minimize future flood damage due to flooding on Canal Creek.

Action: Install a SNOTEL site in the watershed of Canal Creek (7,500' elev.)

Timeframe: Based on funding
Funding: Undetermined
Estimated Cost:
Staff: DES staff will coordinate the effort between Natural Resource Conservation Service and Sanpete County.

Action: Place a Stream Gauge on Canal Creek at the upper diversion.

Timeframe: Based on funding

Funding:
Estimated Cost
Staff:

Action: Perform watershed calibration study and a FLO 2D study of Canal Creek alluvial fan.

Timeframe: Based on funding
Funding: Undetermined
Estimated Cost:
Staff:

Sevier County

COUNTY	CITY/TOWN	POPULATION	LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Unincorporated Sevier Co		3314		490121 - 9/7/98	
Sevier	Annabella	603	H4	490122 - 10/30/79(M)	
Sevier	Aurora	947	G4	490123 - 1/12/82(M)	
Sevier	Elsinore	733	H4	490125 - 4/6/98(M)	
Sevier	Glenwood	437	H4	490126A - 7/1/86(L)	
Sevier	Joseph	269	H4	490127 - 6/2/95	
Sevier	**Koosharem**	276	H4	490128 - (NSFHA)	
Sevier	**Monroe**	1845	H4	490129 - 7/24/79(M)	
Sevier	Redmond	788	G4	490130 - (NSFHA)	
Sevier	Richfield	6847	H4	490131 - 9/29/86	
Sevier	**Salina**	2393	G4	490132 - 9/29/86	
Sevier	Sigurd	430	H4	490133A - 1/1/86(L)	

Sevier County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Sevier	July 11-17, 1896	Koosharem, Annabella, Elsinore, Joseph, Monroe, Richfield, Sevier, and Sigurd.	Widespread damage	Koosharem inundated.

Hazards	**Date**	**Location**	**Critical Facility or Area Impacted**	**Comments**
Flood Sevier	1896-1929	Monroe	Unknown	13 floods impacted Monroe over 33-year timeframe.
Flood Sevier	July 31, 1943	Monroe	Homes farmlands, crops, and livestock	$80,000 in damage. Canyon on East Mountain
Flood Sevier	August 5, 1943	Monroe	Extremely heavy rains damage homes, highways, canals, crops, city pipelines, and power plant.	$120,000 in damage city without power for two weeks
Flood Sevier	July 27, 1951	Salina	Property and residential areas	Source East Canyon
Flood Sevier	September 5, 1960	Glenwood/Sigurd	Roads, bridges, and property	$15,000 plus. Highway 119 and 24 extensively damaged
Flood Sevier	July, 31, 1961	Richfield	U.S. 89 damaged along with irrigation canal	Source Cottonwood Canyon
Flood Sevier	August 11, 1961	Richfield	Property damage in northeast section of city.	Source Cottonwood Canyon damage $3,700
Flood Sevier	August 15, 1964	Sigurd/Aurora	Crops and irrigation system.	Anderson Wash and Lost Creek $1,600

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Sevier	August 17, 1965	Annabella/Glenwood	Crops, farms, roads, and fences.	$38,000 in damage
Flood Sevier	August 6, 1967	Richfield/Central	Damage to homes, farms, and crops.	Source Flat and Cottonwood Canyons $30,000 in damage.
Flood Sevier	July 24, 1968	Richfield	Damage to homes	
Flood Sevier	July 30, 1968	Richfield/Elsinore	U.S. 89 covered with debris and water. Farmlands and buildings damaged.	Source Flat and Cottonwood Canyons
Flood Sevier	August 8, 1968	Richfield	Farmlands and buildings	Source: Cottonwood Creek, $2,000 + in damages.
Flood Sevier	July 24, 1969	Redmond/Sigurd	Farmlands and irrigation canals.	
Flood Sevier Presidential	1983	Monroe, Richfield, and Salina	Damage in all sectors	Source Sevier River, Monroe, Cottonwood, and Salina Creek.
Flood Sevier Presidential	1984	County wide	All sectors impacted by event loss to road, culverts, agriculture, sewer, infrastructure, flood controls, etc.	Public assistance totals $185,545 (1984 dollars)

(All dollar values for given are for year of disaster)

Unincorporated Sevier County

Problem Identification: Sevier County is one of the few counties in the state where every municipality participates in the NFIP. Only about 18 percent of this county's population lives in unincorporated areas of the county. Development should be avoided adjacent to the Sevier and other major rivers and creeks (and their tributaries) where the threat of flooding is greatest. The FEMA FIRMs identify most areas as Zones C and X (little to no flood threat) with the areas adjacent to the rivers and creeks identified as Zone A – 100 year flood risk. Lakes/Reservoirs include: Fish Lake, Johnson Valley, Koosharem, Rocky Ford, and Forsyth.

Objective: Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances

Timeframe:
Funding:
Estimated Cost: Minimal – almost nothing.
Staff:

Koosharem

Problem Identification: Koosharem Creek has a rather large drainage area of several square miles at Koosharem. According to the USGS quadrangle map, there is a weir/aqueduct diversion about 2 miles upstream of town.

Objective: Minimize future flood damage from Koosharem Creek through Koosharem.

Action: Improve existing dike along Koosharem Creek
Time Frame:
Funding:
Estimated Cost: about $300,000
Staff:
Background: Raise and extend the existing dike along the east side of town for a distance of approximately 6,000 ft. (Provisions will need to be made for low flows to enter the Koosharem Canal and riprap at the south end of the levee where diverted flood flows will pass.)

Monroe

Problem Identification: Monroe Creek with a drainage area of 39 square miles at Monroe. Monroe Creek has the potential of causing flood damage below Bohman Road, because of decreased channel capacity and constrictions. Constrictions include the culvert at Jones Road, and bridges at Jones Road, 8th South and 4th south.

Objective: Minimize future flood damage along Monroe Creek through Monroe City.

Action: Modify bridges along Monroe Creek

Timeframe:
Funding:
Estimated Cost:
Background: Enlarge or add to bridges especially Jones Road Bridge to increase the channel capacity to at least match the capacity of the Bohman Road bridge.

Action: Maintain and improve existing levee along Monroe Creek

Time Frame:
Funding:
Estimated Cost: Minimal
Staff:
Background: Flatten the side slopes, filling in depressions and rodent holes, and removing any deep-rooted plants along the levee. Fill and protect locations where the levee is eroded with riprap or other armoring.

Action: Inform residents of the availability of flood insurance

Timeframe:
Funding:
Estimated Cost:
Background:

Salina

Problem Identification: Salina Creek has the potential of causing flood damage with in the City of Salina. Approximately 35 structures could be affected by a 100-year flood event. The majority of these structures are singe-family residences and a few small businesses. The Mayor of Salina indicated very little new development had occurred on the west side of town primarily due to the flood threat. The existing levee and channel appear to provide some flood protection. However some minor damage would take place for an event with a frequency of 50-years.

Objective: Minimize future flood damage along Salina Creek through Salina City.

Action: Maintain and improve existing levee along Salina Creek

Time Frame:
Funding:
Estimated Cost: Minimal

Staff:
Background: Flatten the side slopes, filling in depressions and rodent holes, and removing any deep-rooted plants along the levee. Fill and protect locations where the levee is eroded with riprap or other armoring.

Action: Maintenance of channels and bridge openings
Time Frame:
Funding:
Estimated Cost: Minimal
Staff:
Background: Keep all bridge openings and upstream channels free of debris to prevent constriction during high flows.

Wayne County

COUNTY	CITY/TOWN	POPULATION	LOCATION	NFIP STATUS	THREAT (or NSFHA-eligible)
Unincorporated Wayne County		986		**Not Participating**	Dirty Devil, Freemont, and Tribs
Wayne	Bicknell	353	I5	490184 - (NSFHA)	
Wayne	**Hanksville**	240	I6	**Not Participating**	Major flood threat from Bull Creek
Wayne	Loa	525	H5	490185 - NITP	
Wayne	**Lyman**	234	H5	**Not Participating**	Moderate flood threat from drainages to the east
Wayne	Torrey	171	I5	490186 - (NSFHA)	

Wayne County Flood and Dam failure History

Hazards	Date	Location	Critical Facility or Area Impacted	Comments
Flood Wayne	August 4, 1957	Caineville	Destroyed bridge west of town blocked Highway 24	Source Fremont River
Flood Wayne	August 25, 1961	Torrey	Highway 24 damaged	Source South Desert Wash
Flood Wayne	July 31, 1965	Bicknell/Lyman/ Teasdale/ Loa	Damage to homes, crops, ranches, and Highway 24 and 117	Heavy rains flooded area creeks.
Flood Wayne	August 18, 1965	Bicknell	Farmland, crops, orchards, and Highway 68 all damaged	10,000 acres of farmland destroyed.

(All dollar values for given are for year of disaster)

Unincorporated Wayne County

Problem Identification: Almost 40 percent of this county's population lives in unincorporated areas of the county. Development adjacent to the Dirty Devil and Fremont Rivers (and their tributaries) should be prevented. Areas adjacent to Green River are protected from development for the most part by Canyonlands National Park. There are no FEMA FIRMs for the unincorporated areas of the County although there are areas of risk. There are three high hazard dams, which would impact Wayne County, if failure were to occur. Two of these dams, Johnson Dam and Forsythe Dam, are physically located in Sevier County adjacent to the Wayne County line and upstream on the Fremont River from the third dam Mill Meadow, which is located in Wayne County. The possibility exists for failure of one dam resulting in failure of downstream dams. Wayne County is very large in area and very small in populations, however the majority of the population does live below and within about thirty miles of the above-mentioned dams and within a few miles of the Fremont River and its flood plain.

Objective: Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the County to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances

Timeframe:
Funding:
Estimated Cost: Minimal – almost nothing.
Staff:

Hanksville

Problem Identification: There is a major flood threat from Bull Creek – especially on the east side of town. The city has made some channel improvements but the culvert and crossing at Highway 24 is offset from the flow line of the channel by 6 ft or more (according to the city engineer). UDOT is looking into this problem.

Objective: Minimize future flood damage in Hanksville.

Action: Culvert improvements are needed at Highway 24 and additional channel work. Another alternative would be about 1 mile of levee.

Timeframe:
Funding:
Estimated Cost: On the order of $0.5 to $1 million.
Staff:

Lyman

Problem Identification: There is a moderate flood threat from the unnamed drainages to the east.

Objective: Minimize future flood damage in Lyman.

Alternative Action: There is a High Line Ditch located between the town and the east side drainages. It appears that the ditch when needed could convey some floodwaters. A structural project could consist of improving this ditch to increase its capacity.

Timeframe:
Funding:
Estimated Cost: Approximately $300,000.
Staff:

Alternative Action: An alternative structural project could consist of constructing about a mile long deflector levee.

Timeframe:
Funding:
Estimated Cost: Approximately $300,000.
Staff:

Need For Additional Research

Additional research should be conducted to better map communities currently mapped as a FEMA Zone D, or currently unmapped communities, and communities with out dated Flood Insurance Rate Maps. Communities would benefit from knowing peak flows and stages on tributaries of concern.

Appendix O

HAZUS-MH: Earthquake Event Report

Region Name: ***Juab County 2500 Year Event***

Earthquake Scenario: ***Juab County 2500 Year Event***

Print Date: ***October 20, 2003***

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes one county(ies) from the following state(s):

Utah

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 3,402.00 square miles and contains two census tracts. There are over two thousand households in the region and has a total population of 8,238 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated two thousand buildings in the region with a total building replacement value (excluding contents) of 386 (millions of dollars). Approximately 99.00 % of the buildings (and 83.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 1,276 and 65 (millions of dollars) respect.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are two thousand buildings in the region, which have an aggregate total replacement value of 386 (millions of dollars). Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 73% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there is one (1) hospital in the region with a total bed capacity of 19 beds. There are six (6) schools, one (1) fire station, two (2) police stations and one (1) emergency operations facility. With respect to HPL facilities, there are eight (8) dams identified within the region. Of these, two (2) of the dams are classified as 'high hazard'. The inventory also includes six (6) hazardous material sites, zero (0) military installations and zero (0) nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data is provided in Tables 2 and 3.

The total value of the lifeline inventory is over 1,341.00 (millions of dollars). This inventory includes over 299 kilometers of highways, 80 bridges, 0 kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	80	64.80
	Segments	23	1,065.00
	Tunnels	0	0.00
		Subtotal	**1,129.90**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	36	110.30
	Tunnels	0	0.00
		Subtotal	**110.30**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	1	5.30
	Runways	1	30.50
		Subtotal	**35.80**
		Total	**1,276.00**

Table 3: Utility System Lifeline inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Waste Water	Facilities	1	65.30
	Pipelines	0	0.00
		Subtotal	**65.30**
Natural Gas	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
OIL Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**65.30**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Juab County 2500Year Event
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	
Probabilistic Return Period	2,500
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.00
Depth (Km)	0
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Building Damage

Building Damage

HAZUS estimates that about 947 thousand buildings will be at least moderately damaged. This is over 40.00 % of the total number of buildings in the region. There are an estimated 85 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	1	0.16	1	0.16	2	0.32	2	0.75	1	1.19
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.01	0	0.02	0	0.05	0	0.13	0	0.20
Industrial	1	0.14	1	0.18	3	0.52	3	1.46	2	2.56
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	30	4.32	49	6.62	88	13.51	58	27.26	18	21.4
Single Family	664	95.37	689	93.02	556	85.60	149	70.40	64	74.6
Total	**696**		**741**		**650**		**212**		**85**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.01	0	0.01	0	0.02	0	0.04	0	0.05
MH*	30	4.25	48	6.48	86	13.31	57	26.95	18	20.97
Pre-cast	0	0.04	0	0.06	1	0.22	1	0.69	1	1.33
RM*	93	13.34	53	7.17	96	14.78	73	34.26	28	32.81
Steel	1	0.00	0	0.01	0	0.03	0	0.12	0	0.26
UM*	3	0.48	5	0.68	10	1.52	11	4.98	15	17.46
Wood	569	81.68	632	85.35	453	69.61	67	31.78	22	25.56
Total	**696**		**741**		**650**		**212**		**85**	

*Note:

RM Reinforced Masonry
URM Un-reinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 19 hospital beds available for use. On the day of the earthquake, the model estimates that only one hospital bed (9.00%) is available for use by patients already in the hospital and those injured by the earthquake. After one week, 39.00% of the beds will be back in service. By 30 days, 82.00% will be operational.

Table 6: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Least Moderate Damage > 50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	1	1	0	0
Schools	6	1	0	0
EOCs	1	0	0	1
Police Stations	2	0	0	0
Fire Stations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	23	0	0	23	23
	Bridges	80	16	0	64	64
	Tunnels	0	0	0	0	0
Railways	Segments	36	0	0	36	36
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	1	1	0	1	1
	Runways	1	0	0	1	1

Note: Roadway segments; railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8: Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 9 : Expected Utility System Pipeline Damage

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	0	0	0
Waste Water	0	0	0
Natural Gas	0	0	0
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	2,456	0	0	0	0	0
Electric Power		1,968	1,580	1,353	1,291	1,208

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be one (1) ignition that will burn about 0.01 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about three (3) people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of zero (0) million tons of debris will be generated. Of the total amount, Brick/Wood comprises 32.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require zero truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (94 households to be displaced due to the earthquake. Of these, 22 people (out of a total population of 8,238 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows:

- · Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- · Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- · Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- · Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum. The 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	1	0	0	0
	Industrial	0	0	0	0
	Residential	10	2	0	0
	Single Family	29	7	1	2
	Total	**40**	**10**	**1**	**3**
2 PM	Commercial	26	7	1	2
	Commuting	0	0	0	0
	Educational	11	3	1	1
	Hotels	0	0	0	0
	Industrial	2	1	0	0
	Residential	2	1	0	0
	Single Family	7	2	0	0
	Total	**48**	**13**	**2**	**4**
5 PM	Commercial	22	6	1	2
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Residential	4	1	0	0
	Single Family	11	3	0	1
	Total	**39**	**10**	**2**	**3**

Economic Loss

The total building-related economic loss estimated for the earthquake is $70.98 (millions of dollars), which represents % of the total replacement value of the region's buildings. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 70.98 (millions of dollars); 7% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 63 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.21	0.89	0.17	0.04	1.31
	Capital-Related	0.00	0.09	0.71	0.10	0.01	0.91
	Rental	1.34	0.62	0.61	0.17	0.02	2.75
	Relocation	0.13	0.01	0.03	0.02	0.00	0.19
	Subtotal	**1.47**	**0.93**	**2.23**	**0.45**	**0.08**	**5.16**
Capital Stock Loses							
	Structural	6.64	1.18	1.80	1.96	0.19	11.77
	Non-Structural	23.36	4.76	4.39	6.84	0.57	39.91
	Content	5.77	0.92	1.97	4.66	0.24	13.55
	Inventory	0.00	0.00	0.08	0.50	0.00	0.59
	Subtotal	**35.77**	**6.86**	**8.24**	**13.96**	**1.00**	**65.82**
	Total	**37.24**	**7.79**	**10.47**	**14.41**	**1.08**	**70.98**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	1,065	0	0.00
	Bridges	65	11	17.06
	Tunnels	0	0	0.00
	Subtotal	**1129.90**	**11.10**	
Railways	Segments	110	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**110.30**	**0.00**	
Light Rail	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	5	2	40.34
	Runways	30	0	0.00
	Subtotal	**35.80**	**2.20**	
	Total	**1276.00**	**13.20**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Communication	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	65.30	0.00	0.00
	Subtotal	**65.27**	**$0.00**	
	Total	**65.27**	**$0.00**	

Table 15. Indirect Economic Impact
(with outside aid)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(1)	-4.46
Second Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-13.57
Third Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-17.46
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-17.46
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-17.46
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(2)	-17.46

Appendix A: County Listing for the Region

Juab, UT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah					
	Juab	8,238	320	65	386
Total State		**8,238**	**320**	**65**	**386**
Total Region		**8,238**	**320**	**65**	**386**

Appendix O

HAZUS-MH: Earthquake Event Report

Region Name: ***Millard County 2500 Year Event***

Earthquake Scenario: ***Millard County 2500 Year Event***

Print Date: ***October 20, 2003***

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes one county(ies) from the following state(s):

Utah

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 6,820.28 square miles and contains three census tracts. There are over three thousand households in the region and has a total population of 12,405 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated three thousand buildings in the region with a total building replacement value (excluding contents) of 599 (millions of dollars). Approximately 99.00 % of the buildings (and 84.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 2,951 and 109(millions of dollars), respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are three thousand buildings in the region which have an aggregate total replacement value of 599 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 72% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are two (2) hospitals in the region with a total bed capacity of 40 beds. There are 12 schools, five (5) fire stations, two (2) police stations and, zero (0) emergency operation facilities. With respect to HPL facilities, there are 14 dams identified within the region. Of these, three (3) of the dams are classified as 'high hazard'. The inventory also includes 22 hazardous material sites, zero (0) military installations and zero (0) nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data is provided in Tables 2 and 3.

The total value of the lifeline inventory is over 3,060.00 (millions of dollars). This inventory includes over 637 kilometers of highways, 93 bridges, zero kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	93	88.70
	Segments	64	2,600.90
	Tunnels	0	0.00
		Subtotal	**2,689.60**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	62	118.90
	Tunnels	0	0.00
		Subtotal	**118.90**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	4	21.40
	Runways	4	121.80
		Subtotal	**143.20**
		Total	**2,951.70**

Table 3: Utility System Lifeline inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Waste Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Natural Gas	Facilities	1	1.10
	Pipelines	0	0.00
		Subtotal	**1.10**
OIL Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	1	107.80
		Subtotal	**107.80**
Communication	Facilities	2	0.20
		Subtotal	**0.20**
		Total	**109.10**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Millard County 2500 Year Event
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	
Probabilistic Return Period	2,500
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.00
Depth (Km)	0
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Building Damage

Building Damage

HAZUS estimates that about 1,215 thousand buildings will be at least moderately damaged. This is over 32.00 % of the total number of buildings in the region. There are an estimated 69 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.03	1	0.04	1	0.07	0	0.11	0	0.16
Commercial	4	0.28	4	0.34	6	0.67	3	1.17	1	1.54
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.03	0	0.04	1	0.08	0	0.15	0	0.18
Industrial	0	0.02	0	0.02	0	0.04	0	0.07	0	0.09
Religion	2	0.13	2	0.14	2	0.23	1	0.40	0	0.47
Residential	60	4.47	99	8.02	173	19.58	106	40.23	23	32.4
Single Family	1,275	95.03	1,123	91.41	700	79.33	153	57.87	45	65.1
Total	**1,342**		**1,229**		**883**		**264**		**69**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	1	0.01	0	0.01	0	0.03	0	0.04	0	0.04
MH*	57	4.21	95	7.73	170	19.30	105	39.97	22	32.14
Pre-cast	0	0.02	0	0.02	1	0.07	0	0.15	0	0.22
RM*	181	13.49	101	8.26	151	17.08	85	32.30	16	22.40
Steel	2	0.01	0	0.01	0	0.03	0	0.08	0	0.07
UM*	7	0.51	10	0.85	19	2.14	17	6.46	15	21.57
Wood	1,094	81.44	1017	82.74	536	60.65	52	19.90	16	22.46
Total	**1,342**		**1,229**		**883**		**264**		**69**	

*Note:
RM Reinforced Masonry
URM Un-reinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 40 hospital beds available for use. On the day of the earthquake, the model estimates that only 14 hospital beds (35.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 73.00% of the beds will be back in service. By 30 days, 96.00% will be operational.

Table 6: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Least Moderate Damage > 50%**	**Complete Damage > 50%**	**Functionality > 50% at day 1**
Hospitals	2	0	0	0
Schools	12	0	0	2
EOCs	0	0	0	0
Police Stations	2	0	0	0
Fire Stations	5	0	0	0

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	64	0	0	64	64
	Bridges	93	23	0	70	73
	Tunnels	0	0	0	0	0
Railways	Segments	62	0	0	62	62
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	4	0	0	4	4
	Runways	4	0	0	4	4

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8: Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	1	0	0	1	1
Oil Systems	0	0	0	0	0
Electrical Power	1	0	0	1	1
Communication	2	0	0	1	2

Table 9: Expected Utility System Pipeline Damage

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	0	0	0
Waste Water	0	0	0
Natural Gas	0	0	0
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	3,840	0	0	0	0	0
Electric Power		3,840	3,840	3,840	3,840	3,840

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be one ignition that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about zero people and burn about zero (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of zero million tons of debris will be generated. Of the total amount, Brick/Wood comprises 36.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require zero truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (70 households to be displaced due to the earthquake. Of these, 16 people (out of a total population of 12,405 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life threatening.
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum; the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Residential	10	2	0	0
	Single Family	26	6	1	1
	Total	**37**	**8**	**1**	**2**
2 PM	Commercial	27	7	1	2
	Commuting	0	0	0	0
	Educational	6	2	0	0
	Hotels	0	0	0	0
	Industrial	2	0	0	0
	Residential	2	0	0	0
	Single Family	5	1	0	0
	Total	**42**	**11**	**2**	**3**
5 PM	Commercial	21	6	1	2
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Residential	4	1	0	0
	Single Family	10	2	0	1
	Total	**36**	**9**	**1**	**2**

Economic Loss

The total building-related economic loss estimated for the earthquake is $68.19 (millions of dollars), which represents % of the total replacement value of the region's buildings. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 68.19 (millions of dollars); 10 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 68 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.12	1.81	0.03	0.10	2.06
	Capital-Related	0.00	0.05	1.23	0.03	0.04	1.34
	Rental	1.41	0.52	0.90	0.01	0.08	2.92
	Relocation	0.14	0.02	0.05	0.00	0.02	0.23
	Subtotal	**1.55**	**0.70**	**3.99**	**0.07**	**0.24**	**6.55**
Capital Stock Loses							
	Structural	6.90	1.23	2.55	0.29	0.94	11.92
	Non-Structural	24.50	4.57	6.14	0.88	1.89	37.98
	Content	6.41	0.83	2.83	0.56	0.91	11.54
	Inventory	0.00	0.00	0.10	0.06	0.03	0.19
	Subtotal	**37.81**	**6.64**	**11.62**	**1.80**	**3.78**	**61.64**
	Total	**39.36**	**7.33**	**15.61**	**1.87**	**4.02**	**68.19**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2,601	0	0.00
	Bridges	89	11	12.43
	Tunnels	0	0	0.00
	Subtotal	**2689.60**	**11.00**	
Railways	Segments	119	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**118.90**	**0.00**	
Light Rail	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	21	5	22.19
	Runways	122	0	0.00
	Subtotal	**143.20**	**4.70**	
	Total	**2951.70**	**15.80**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Communication	Facilities	0.20	0.01	6.99
	Subtotal	**0.20**	**$0.01**	
Electrical Power	Facilities	107.80	0.00	0.00
	Subtotal	**107.80**	**$0.00**	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	1.10	0.00	0.00
	Subtotal	**1.07**	**$0.00**	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**109.06**	**$0.01**	

Table 15. Indirect Economic Impact
(with outside aid)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(1)	-1.81
Second Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-5.52
Third Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-7.10
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-7.10
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(2)	-7.10
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(2)	-7.10

Appendix A: County Listing for the Region

Millard, UT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah					
	Millard	12,405	504	95	599
Total State		**12,405**	**504**	**95**	**599**
Total Region		**12,405**	**504**	**95**	**599**

Appendix O

HAZUS-MH: Earthquake Event Report

Region Name: ***Piute County 2500 Year Event***

Earthquake Scenario: ***Piute County 2500 Year Event***

Print Date: ***October 20, 2003***

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software, which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes one county(ies) from the following state(s):

Utah

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 765.04 square miles and contains one census tract. There are over zero thousand households in the region and has a total population of 1,435 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated zero thousand buildings in the region with a total building replacement value (excluding contents) of 96 (millions of dollars). Approximately 99.00 % of the buildings (and 87.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 445 and zero (millions of dollars), respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are zero thousand buildings in the region, which have an aggregate total replacement value of 96 (millions of dollars). Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 73% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are zero (0) hospitals in the region with a total bed capacity of zero (0) beds. There are three (3) schools, zero (0) fire stations, one (1) police station and zero (0) emergency operation facilities. With respect to HPL facilities, there are four (4) dams identified within the region. Of these, four (4) of the dams are classified as 'high hazard'. The inventory also includes zero (0) hazardous material sites, zero (0) military installations and zero (0) nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data is provided in Tables 2 and 3.

The total value of the lifeline inventory is over 445.00 (millions of dollars). This inventory includes over 117 kilometers of highways, 17 bridges, zero kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	17	4.50
	Segments	17	404.80
	Tunnels	0	0.00
		Subtotal	**409.30**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	1	5.30
	Runways	1	30.50
		Subtotal	**35.80**
		Total	**445.10**

Table 3: Utility System Lifeline inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Waste Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Natural Gas	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
OIL Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**0.00**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Piute County 2500Year Event
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	
Probabilistic Return Period	2,500
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.00
Depth (Km)	0
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Building Damage

Building Damage

HAZUS estimates that about 0 thousand buildings will be at least moderately damaged. This is over 0.00 % of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	1	0.16	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	4	0.63	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	65	10.17	0	0.00	0	0.00	0	0.00	0	0.00
Single Family	569	89.05	0	0.00	0	0.00	0	0.00	0	0.00
Total	**639**		**0**		**0**		**0**		**0**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	1	0.02	0	0.00	0	0.00	0	0.00	0	0.00
MH*	65	10.18	0	0.00	0	0.00	0	0.00	0	0.00
Pre-cast	1	0.13	0	0.00	0	0.00	0	0.00	0	0.00
RM*	86	13.50	0	0.00	0	0.00	0	0.00	0	0.00
Steel	1	0.06	0	0.00	0	0.00	0	0.00	0	0.00
UM*	17	2.73	0	0.00	0	0.00	0	0.00	0	0.00
Wood	468	73.08	0	0.00	0	0.00	0	0.00	0	0.00
Total	**639**		**0**		**0**		**0**		**0**	

*Note:

RM Reinforced Masonry
URM Un-reinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had zero hospital beds available for use. On the day of the earthquake, the model estimates that only zero hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 6: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Least Moderate Damage > 50%**	**Complete Damage > 50%**	**Functionality > 50% at day 1**
Hospitals	0	0	0	0
Schools	3	3	0	0
EOCs	0	0	0	0
Police Stations	1	0	0	1
Fire Stations	0	0	0	0

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	17	0	0	17	17
	Bridges	17	0	0	17	17
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	1	0	0	1	1
	Runways	1	0	0	1	1

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8: Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 9 : Expected Utility System Pipeline Damage

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	0	0	0
Waste Water	0	0	0
Natural Gas	0	0	0
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	509	0	0	0	0	0
Electric Power		509	509	509	509	509

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be zero ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about zero people and burn about zero (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of zero million tons of debris will be generated. Of the total amount, Brick/Wood comprises 0.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require zero truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (zero households to be displaced due to the earthquake. Of these, zero people (out of a total population of 1,435 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows:

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Residential	0	0	0	0
	Single Family	0	0	0	0
	Total	**0**	**0**	**0**	**0**

Economic Loss

The total building-related economic loss estimated for the earthquake is $0.00 (millions of dollars), which represents % of the total replacement value of the region's buildings. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 0.00 (millions of dollars); 0 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 0 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.00	0.00	0.00	0.00	0.00
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Capital Stock Loses							
	Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Non-Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	405	0	0.00
	Bridges	4	0	3.53
	Tunnels	0	0	0.00
	Subtotal	**409.30**	**0.20**	
Railways	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	5	2	31.97
	Runways	30	0	0.00
	Subtotal	**35.80**	**1.70**	
	Total	**445.10**	**1.90**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Communication	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**0.00**	**$0.00**	

Table 15. Indirect Economic Impact
(with outside aid)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Second Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Third Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	0	0.00
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	0	0.00

Appendix A: County Listing for the Region

Piute,UT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah					
	Piute	1,435	83	12	96
Total State		**1,435**	**83**	**12**	**96**
Total Region		**1,435**	**83**	**12**	**96**

Appendix O

HAZUS-MH: Earthquake Event Report

Region Name: ***Sanpete County 2500 Year Event***

Earthquake Scenario: ***Sanpete County 2500 Year Event***

Print Date: ***October 20, 2003***

Disclaimer:
The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software, which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Utah

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,600.76 square miles and contains five census tracts. There are over six thousand households in the region and has a total population of 22,763 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated six thousand buildings in the region with a total building replacement value (excluding contents) of 1,055 (millions of dollars). Approximately 99.00 % of the buildings (and 85.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 1,053 and 238 (millions of dollars), respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 6 thousand buildings in the region, which have an aggregate total replacement value of 1,055 (millions of dollars). Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 73% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are two hospitals in the region with a total bed capacity of 40 beds. There are 13 schools, one fire station, five police stations and zero emergency operation facilities. With respect to HPL facilities, there are 29 dams identified within the region. Of these, six of the dams are classified as ‘high hazard’. The inventory also includes one hazardous material site, zero military installations and zero nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data is provided in Tables 2 and 3.

The total value of the lifeline inventory is over 1,291.00 (millions of dollars). This inventory includes over 293 kilometers of highways, 38 bridges, zero kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	38	6.10
	Segments	56	975.50
	Tunnels	0	0.00
		Subtotal	**981.70**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	2	10.70
	Runways	2	60.90
		Subtotal	**71.60**
		Total	**1,053.30**

Table 3: Utility System Lifeline inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Waste Water	Facilities	2	130.50
	Pipelines	0	0.00
		Subtotal	**130.50**
Natural Gas	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
OIL Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	1	107.80
		Subtotal	**107.80**
Communication	Facilities	5	0.50
		Subtotal	**0.50**
		Total	**238.80**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Sanpete County 2500Year Event
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	
Probabilistic Return Period	2,500
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.00
Depth (Km)	0
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Building Damage

Building Damage

HAZUS estimates that about 2,910 thousand buildings will be at least moderately damaged. This is over 46.00 % of the total number of buildings in the region. There are an estimated 250 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.03	1	0.02	1	0.03	0	0.05	0	0.06
Commercial	4	0.27	5	0.23	9	0.45	6	0.87	3	1.07
Education	1	0.04	1	0.03	1	0.05	1	0.09	0	0.11
Government	1	0.05	1	0.04	2	0.09	1	0.18	0	0.19
Industrial	1	0.08	1	0.06	2	0.12	2	0.24	1	0.29
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	38	2.86	104	4.85	249	12.55	226	33.65	83	33.1
Single Family	1,280	96.68	2,041	94.76	1,723	86.72	437	64.93	163	65.1
Total	**1,324**		**2,154**		**1,987**		**673**		**251**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	2	0.02	0	0.01	1	0.03	0	0.05	0	0.06
MH*	29	2.21	92	4.26	238	11.96	222	32.99	81	32.42
Pre-cast	1	0.03	1	0.03	1	0.07	1	0.16	1	0.22
RM*	157	11.86	156	7.24	308	15.52	226	33.55	68	27.06
Steel	2	0.01	0	0.01	1	0.03	1	0.08	0	0.07
UM*	5	0.35	11	0.52	27	1.37	33	4.84	42	16.69
Wood	1,128	85.17	1887	87.62	1,400	70.45	184	27.30	56	22.51
Total	**1,324**		**2,154**		**1,987**		**673**		**251**	

*Note:
RM Reinforced Masonry
URM Un-reinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 40 hospital beds available for use. On the day of the earthquake, the model estimates that only five hospital beds (13.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 46.00% of the beds will be back in service. By 30 days, 87.00% will be operational.

Table 6: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Least Moderate Damage > 50%**	**Complete Damage > 50%**	**Functionality > 50% at day 1**
Hospitals	2	2	0	0
Schools	13	0	0	0
EOCs	0	0	0	0
Police Stations	5	0	0	0
Fire Stations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	56	0	0	56	56
	Bridges	38	2	0	36	36
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	2	0	0	2	2
	Runways	2	0	0	2	2

Note: Roadway segments; railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8: Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	2	1	0	1	2
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	1	0	0	1	1
Communication	5	4	0	1	5

Table 9 : Expected Utility System Pipeline Damage

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	0	0	0
Waste Water	0	0	0
Natural Gas	0	0	0
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	6,547	0	0	0	0	0
Electric Power		5,331	4,457	4,008	3,895	3,763

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be one ignition that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about zero people and burn about zero(millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of zero million tons of debris will be generated. Of the total amount, Brick/Wood comprises 35.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require zero truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (234 households to be displaced due to the earthquake. Of these, 56 people (out of a total population of 22,763 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows:

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	1	0	0	0
	Industrial	2	0	0	0
	Residential	34	8	1	1
	Single Family	79	19	2	5
	Total	**116**	**27**	**3**	**7**
2 PM	Commercial	38	11	2	3
	Commuting	0	0	0	0
	Educational	37	11	2	3
	Hotels	0	0	0	0
	Industrial	13	4	1	1
	Residential	6	1	0	0
	Single Family	17	4	1	1
	Total	**110**	**30**	**5**	**9**
5 PM	Commercial	44	13	2	4
	Commuting	0	0	0	0
	Educational	6	2	0	1
	Hotels	0	0	0	0
	Industrial	8	2	0	1
	Residential	13	3	0	1
	Single Family	31	7	1	2
	Total	**101**	**27**	**4**	**8**

Economic Loss

The total building-related economic loss estimated for the earthquake is $181.49 (millions of dollars), which represents % of the total replacement value of the region's buildings. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 181.49 (millions of dollars); 8 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 73 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.48	2.63	0.17	0.46	3.74
	Capital-Related	0.00	0.20	2.09	0.10	0.17	2.56
	Rental	3.91	1.65	1.40	0.08	0.18	7.22
	Relocation	0.37	0.05	0.07	0.01	0.07	0.56
	Subtotal	**4.27**	**2.38**	**6.20**	**0.36**	**0.87**	**14.09**
Capital Stock Loses							
	Structural	19.12	4.04	4.24	1.33	2.85	31.57
	Non-Structural	67.34	15.33	10.36	4.24	7.55	104.81
	Content	16.77	3.00	4.66	2.73	3.14	30.30
	Inventory	0.00	0.00	0.18	0.47	0.07	0.71
	Subtotal	**103.22**	**22.37**	**19.44**	**8.76**	**13.60**	**167.39**
	Total	**107.50**	**24.75**	**25.64**	**9.12**	**14.48**	**181.49**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	976	0	0.00
	Bridges	6	0	7.54
	Tunnels	0	0	0.00
	Subtotal	**981.70**	**0.50**	
Railways	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	11	3	31.60
	Runways	61	0	0.00
	Subtotal	**71.60**	**3.40**	
	Total	**1053.30**	**3.80**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Communication	Facilities	0.50	0.08	17.33
	Subtotal	**0.49**	**$0.08**	
Electrical Power	Facilities	107.80	0.00	0.00
	Subtotal	**107.80**	**$0.00**	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	130.50	12.89	9.87
	Subtotal	**130.54**	**$12.89**	
	Total	**238.83**	**$12.97**	

Table 15. Indirect Economic Impact
(with outside aid)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(14)	-17.20
Second Year			
	Employment Impact	0	0.00
	Income Impact	(18)	-21.49
Third Year			
	Employment Impact	0	0.00
	Income Impact	(19)	-23.24
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(19)	-23.24
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(19)	-23.24
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(19)	-23.24

Appendix A: County Listing for the Region

Sanpete, UT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah					
	Sanpete	22,763	893	162	1,055
Total State		**22,763**	**893**	**162**	**1,055**
Total Region		**22,763**	**893**	**162**	**1,055**

HAZUS-MH: Earthquake Event Report

Region Name: ***Sevier County 2500 Year Event***

Earthquake Scenario: ***Sevier County 2500 Year Event***

Print Date: ***October 20, 2003***

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes one county(ies) from the following state(s):

Utah

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,916.31 square miles and contains five census tracts. There are over six thousand households in the region and has a total population of 18,842 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated five thousand buildings in the region with a total building replacement value (excluding contents) of 976 (millions of dollars). Approximately 99.00 % of the buildings (and 84.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 1,843 and 65 (millions of dollars), respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are five thousand buildings in the region which have an aggregate total replacement value of 976 (millions of dollars). Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 73% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there is one hospital in the region with a total bed capacity of 42 beds. There are 17 schools, two fire stations, three police stations and, zero emergency operation facilities. With respect to HPL facilities, there are 14 dams identified within the region. Of these, seven of the dams are classified as 'high hazard'. The inventory also includes zero hazardous material sites, zero military installations and zero nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data is provided in Tables 2 and 3.

The total value of the lifeline inventory is over 1,908.00 (millions of dollars). This inventory includes over 401 kilometers of highways, 157 bridges, zero kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	157	144.40
	Segments	69	1,627.90
	Tunnels	0	0.00
		Subtotal	**1,772.30**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	2	10.70
	Runways	2	60.90
		Subtotal	**71.60**
		Total	**1,843.90**

Table 3: Utility System Lifeline inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Waste Water	Facilities	1	65.30
	Pipelines	0	0.00
		Subtotal	**65.30**
Natural Gas	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
OIL Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	3	0.30
		Subtotal	**0.30**
		Total	**65.60**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Sevier County 2500 Year Event
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	
Probabilistic Return Period	2,500
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.00
Depth (Km)	0
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Building Damage

Building Damage

HAZUS estimates that about 2,816 thousand buildings will be at least moderately damaged. This is over 47.00 % of the total number of buildings in the region. There are an estimated 223 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	7	0.61	10	0.48	18	0.90	12	1.80	5	2.29
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.03	1	0.03	1	0.05	1	0.11	0	0.13
Industrial	1	0.08	1	0.06	2	0.11	1	0.21	1	0.25
Religion	0	0.03	0	0.02	1	0.03	0	0.06	0	0.08
Residential	34	2.91	95	4.70	226	11.55	197	30.84	67	29.8
Single Family	1,120	96.35	1,913	94.71	1,707	87.36	428	66.97	151	67.4
Total	**1,162**		**2,020**		**1,953**		**639**		**223**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	2	0.02	0	0.01	1	0.03	0	0.06	0	0.06
MH*	30	2.56	88	4.36	219	11.20	195	30.47	66	29.39
Pre-cast	1	0.05	1	0.04	2	0.12	2	0.28	1	0.41
RM*	158	13.57	152	7.52	292	14.97	207	32.39	56	25.04
Steel	3	0.01	0	0.01	1	0.03	0	0.07	0	0.05
UM*	5	0.44	12	0.57	27	1.39	31	4.84	37	16.48
Wood	964	82.85	1758	87.05	1,397	71.54	196	30.63	61	27.29
Total	**1,162**		**2,020**		**1,953**		**639**		**223**	

*Note:

RM	Reinforced Masonry
URM	Un-reinforced Masonry
MH	Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 42 hospital beds available for use. On the day of the earthquake, the model estimates that only 42 hospital beds (100.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 100.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

Table 6: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Least Moderate Damage > 50%**	**Complete Damage > 50%**	**Functionality > 50% at day 1**
Hospitals	1	0	0	1
Schools	17	0	0	0
EOCs	0	0	0	0
Police Stations	3	0	0	0
Fire Stations	2	0	0	0

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	69	0	0	69	69
	Bridges	157	4	0	153	157
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	2	2	0	2	2
	Runways	2	0	0	2	2

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	With Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	1	0	0	1	1
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	3	2	0	1	3

Table 9: Expected Utility System Pipeline Damage

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	0	0	0
Waste Water	0	0	0
Natural Gas	0	0	0
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	6,081	0	0	0	0	0
Electric Power		4,281	2,982	2,306	2,138	1,936

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 2 ignitions that will burn about 0.01 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 35.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates (208 households to be displaced due to the earthquake. Of these, 49 people (out of a total population of 18,842 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	3	1	0	0
	Industrial	1	0	0	0
	Residential	25	5	0	1
	Single Family	68	16	2	4
	Total	**97**	**22**	**3**	**5**
2 PM	Commercial	58	17	3	5
	Commuting	0	0	0	0
	Educational	21	6	1	2
	Hotels	0	0	0	0
	Industrial	7	2	0	1
	Residential	5	1	0	0
	Single Family	15	3	0	1
	Total	**106**	**29**	**5**	**9**
5 PM	Commercial	49	14	2	4
	Commuting	0	0	0	0
	Educational	1	0	0	0
	Hotels	1	0	0	0
	Industrial	4	1	0	0
	Residential	9	2	0	0
	Single Family	27	6	1	2
	Total	**91**	**24**	**4**	**7**

Economic Loss

The total building-related economic loss estimated for the earthquake is $175.83 (millions of dollars), which represents % of the total replacement value of the region's buildings. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 175.83 (millions of dollars); 10 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 71 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.74	3.94	0.19	0.19	5.06
	Capital-Related	0.00	0.31	3.41	0.11	0.04	3.87
	Rental	3.77	1.65	2.21	0.06	0.09	7.79
	Relocation	0.35	0.04	0.10	0.00	0.02	0.52
	Subtotal	**4.12**	**2.75**	**9.66**	**0.36**	**0.33**	**17.23**
Capital Stock Loses							
	Structural	18.50	3.03	6.67	0.95	0.88	30.03
	Non-Structural	65.80	11.94	16.03	3.08	2.06	98.92
	Content	16.44	2.32	7.26	1.95	0.96	28.94
	Inventory	0.00	0.00	0.29	0.39	0.03	0.71
	Subtotal	**100.74**	**17.30**	**30.25**	**6.37**	**3.93**	**158.59**
	Total	**104.87**	**20.05**	**39.91**	**6.73**	**4.27**	**175.83**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	1,628	0	0.00
	Bridges	144	10	7.13
	Tunnels	0	0	0.00
	Subtotal	**1772.30**	**10.30**	
Railways	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	11	4	35.12
	Runways	61	0	0.00
	Subtotal	**71.60**	**3.80**	
	Total	**1843.90**	**14.00**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Communication	Facilities	0.30	0.05	16.80
	Subtotal	**0.29**	**$0.05**	
Electrical Power	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	65.30	0.00	0.00
	Subtotal	**65.27**	**$0.00**	
	Total	**65.56**	**$0.05**	

Table 15. Indirect Economic Impact
(with outside aid)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(3)	-3.35
Second Year			
	Employment Impact	0	0.00
	Income Impact	(6)	-7.28
Third Year			
	Employment Impact	0	0.00
	Income Impact	(7)	-8.96
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(7)	-8.96
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(7)	-8.96
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(7)	-8.96

Appendix A: County Listing for the Region

Sevier,UT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah					
	Sevier	18,842	821	154	976
Total State		**18,842**	**821**	**154**	**976**
Total Region		**18,842**	**821**	**154**	**976**

Appendix O

HAZUS-MH: Earthquake Event Report

Region Name: ***Wayne County 2500 Year Event***

Earthquake Scenario: ***Wayne County 2500 Year Event***

Print Date: ***October 20, 2003***

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software, which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

Table of Contents

General Description of the Region

HAZUS is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes one county(ies) from the following state(s):

Utah

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 2,464.16 square miles and contains one census tract. There are zero thousand households in the region and has a total population of 2,509 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated one thousand buildings in the region with a total building replacement value (excluding contents) of 168 (millions of dollars). Approximately 99.00 % of the buildings (and 88.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 621 and zero (millions of dollars), respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are one thousand buildings in the region, which have an aggregate total replacement value of 168 (millions of dollars). Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 70% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

HAZUS breaks critical facilities into two (2) groups: essential facilities and high potential loss (HPL) facilities. Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are zero hospitals in the region with a total bed capacity of zero beds. There are one school, zero fire stations, one police station and zero emergency operation facilities. With respect to HPL facilities, there are six dams identified within the region. Of these, zero of the dams are classified as ‘high hazard’. The inventory also includes zero hazardous material sites, zero military installations and zero nuclear power plants.

Transportation and Utility Lifeline Inventory

Within HAZUS, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data is provided in Tables 2 and 3.

The total value of the lifeline inventory is over 621.00 (millions of dollars). This inventory includes over 202 kilometers of highways, 15 bridges, zero (0) kilometers of pipes.

Table 2: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	15	7.20
	Segments	17	542.30
	Tunnels	0	0.00
		Subtotal	**549.50**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
		Subtotal	**0.00**
Bus	Facilities	0	0.00
		Subtotal	**0.00**
Ferry	Facilities	0	0.00
		Subtotal	**0.00**
Port	Facilities	0	0.00
		Subtotal	**0.00**
Airport	Facilities	2	10.70
	Runways	2	60.90
		Subtotal	**71.60**
		Total	**621.10**

Table 3: Utility System Lifeline inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Waste Water	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Natural Gas	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
OIL Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**0.00**

Earthquake Scenario

HAZUS uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Wayne County 2500 Year Event
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	
Probabilistic Return Period	2,500
Longitude of Epicenter	0.00
Latitude of Epicenter	0.00
Earthquake Magnitude	7.00
Depth (Km)	0
Rupture Length (Km)	0.00
Rupture Orientation (degrees)	0.00
Attenuation Function	

Building Damage

Building Damage

HAZUS estimates that about 347 thousand buildings will be at least moderately damaged. This is over 31.00 % of the total number of buildings in the region. There are an estimated 12 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS technical manual. Table 4 below summaries the expected damage by general occupancy for the buildings in the region. Table 5 summaries the expected damage by general building type.

Table 4: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	2	0.53	2	0.50	2	0.97	1	1.47	0	2.28
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.07	0	0.06	0	0.12	0	0.19	0	0.27
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	31	7.11	37	11.03	61	24.23	28	33.65	4	34.6
Single Family	405	92.29	300	88.41	188	74.67	54	64.68	8	62.7
Total	**438**		**339**		**251**		**84**		**12**	

Table 5: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.02	0	0.01	0	0.04	0	0.05	0	0.09
MH*	31	7.02	37	10.94	61	24.15	28	33.57	4	34.60
Pre-cast	0	0.03	0	0.03	0	0.08	0	0.20	0	0.31
RM*	53	12.02	23	6.69	41	16.30	26	30.89	3	22.08
Steel	1	0.09	0	0.08	0	0.16	0	0.19	0	0.43
UM*	5	1.21	6	1.79	9	3.45	6	7.05	3	27.14
Wood	348	79.31	272	80.14	139	55.28	23	27.39	2	14.56
Total	**438**		**339**		**251**		**84**		**12**	

*Note:

RM Reinforced Masonry
URM Un-reinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 6: Expected Damage to Essential Facilities

Classification	Total	# Facilities Least Moderate Damage > 50%	Complete Damage > 50%	Functionality > 50% at day 1
Hospitals	0	0	0	0
Schools	1	0	0	1
EOCs	0	0	0	0
Police Stations	1	0	0	1
Fire Stations	0	0	0	0

Transportation and Utility Lifeline Damage

Table 7 provides damage estimates for the transportation system.

Table 7: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	17	0	0	17	17
	Bridges	15	0	0	15	15
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	2	0	0	2	2
	Runways	2	0	0	2	2

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 8-10 provide information on the damage to the utility lifeline systems. Table 8 provides damage to the utility system facilities. Table 9 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, HAZUS performs a simplified system performance analysis. Table 10 provides a summary of the system performance information.

Table 8 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	With Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 9: Expected Utility System Pipeline Damage

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	0	0	0
Waste Water	0	0	0
Natural Gas	0	0	0
Oil	0	0	0

Table 10: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	890	0	0	0	0	0
Electric Power		890	890	890	890	890

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. HAZUS uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be zero (0) ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about zero (0) people and burn about zero (0) (millions of dollars) of building value.

Debris Generation

HAZUS estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of zero (0) million tons of debris will be generated. Of the total amount, Brick/Wood comprises 35.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require zero (0) truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates seven (7) households to be displaced due to the earthquake. Of these, one (1) people out of a total population of 2,509 will seek temporary shelter in public shelters.

Casualties

HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

· Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
· Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
· Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
· Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 11 provides a summary of the casualties estimated for this earthquake.

Table 11: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	1	0	0	0
	Industrial	0	0	0	0
	Residential	2	0	0	0
	Single Family	4	1	0	0
	Total	**7**	**1**	**0**	**0**
2 PM	Commercial	3	1	0	0
	Commuting	0	0	0	0
	Educational	1	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Residential	0	0	0	0
	Single Family	1	0	0	0
	Total	**5**	**1**	**0**	**0**
5 PM	Commercial	3	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Residential	1	0	0	0
	Single Family	2	0	0	0
	Total	**6**	**1**	**0**	**0**

Economic Loss

The total building-related economic loss estimated for the earthquake is $16.85 (millions of dollars), which represents % of the total replacement value of the region's buildings. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 16.85 (millions of dollars); 14 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies, which made up over 79 % of the total loss. Table 12 below provides a summary of the losses associated with the building damage.

Table 12: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Loses							
	Wage	0.00	0.35	0.43	0.00	0.03	0.81
	Capital-Related	0.00	0.15	0.32	0.00	0.01	0.48
	Rental	0.38	0.39	0.15	0.00	0.02	0.93
	Relocation	0.04	0.01	0.01	0.00	0.00	0.05
	Subtotal	**0.42**	**0.89**	**0.91**	**0.01**	**0.06**	**2.28**
Capital Stock Loses							
	Structural	1.88	0.36	0.40	0.03	0.20	2.88
	Non-Structural	6.40	1.32	0.86	0.08	0.36	9.01
	Content	1.78	0.26	0.40	0.04	0.18	2.65
	Inventory	0.00	0.00	0.01	0.01	0.01	0.03
	Subtotal	**10.06**	**1.94**	**1.67**	**0.15**	**0.74**	**14.57**
	Total	**10.48**	**2.83**	**2.58**	**0.16**	**0.80**	**16.85**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, HAZUS computes the direct repair cost for each component only. There are no losses computed by HAZUS for business interruption due to lifeline outages. Tables 13 & 14 provide a detailed breakdown in the expected lifeline losses.

HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 15 presents the results of the region for the given earthquake.

Table 13: Transportation System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	542	0	0.00
	Bridges	7	0	2.67
	Tunnels	0	0	0.00
	Subtotal	**549.50**	**0.20**	
Railways	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0	0	0.00
	Bridges	0	0	0.00
	Tunnels	0	0	0.00
	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0	0	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	11	3	24.69
	Runways	61	0	0.00
	Subtotal	**71.60**	**2.60**	
	Total	**621.10**	**2.80**	

Table 14: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Communication	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Natural Gas	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Oil Systems	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Potable Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Waste Water	Pipelines	0.00	0.00	0.00
	Facilities	0.00	0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**0.00**	**$0.00**	

Table 15. Indirect Economic Impact
(with outside aid)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	0	-1.70
Second Year			
	Employment Impact	0	0.00
	Income Impact	0	-5.17
Third Year			
	Employment Impact	0	0.00
	Income Impact	(1)	-6.66
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(1)	-6.66
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(1)	-6.66
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(1)	-6.66

Appendix A: County Listing for the Region

Wayne,UT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah					
	Wayne	2,509	148	19	168
Total State		**2,509**	**148**	**19**	**168**
Total Region		**2,509**	**148**	**19**	**168**

Appendix P -- Juab County Mitigation Strategies

Note: Countywide in this document refers to a mitigation strategy benefiting the cities and towns of: Eureka, Levan, Mona, Nephi, and Rocky Ridge.

Earthquake

Goal 1 Reduce Risk of Damage due to Earthquake

Objective 1.1 Minimize earthquake damage to culinary water pipeline east of Levan.

Action: Seismically fit pipeline to withstand earthquake.

Time Frame: Immediate
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Background: Culinary water head house on opposite side of fault line from Town.

Objective 1.2 Reduce structural damage from potential earthquakes in new buildings.

Action: Enforce Uniform Building Code on new construction countywide.

Time Frame: Continual
Funding: County
Estimated Cost: TBD
Staff: County

Background: None

Action: Limit new construction to within 100' of known fault lines by ordinance.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County/Contractual

Background: None

Objective 1.3 Reduce structural damage due to potential earthquake in existing buildings.

Action: Identify and retrofit existing buildings at risk of damage from earthquake.

Time frame: Depends on funding.
Funding: TBD
Estimated Cost: Unknown
Staff: TBD

Background: None

Flood

Goal 1 Reduce Risk of Potential Flooding

Problem Identification: Although designated as a No Special Flood Hazard Area (NSFHA) by FEMA, Levan has experienced several significant flood events, most notably in 1968 when an estimated 4,000 cubic feet per second (cfs) came down Pigeon Creek. Flooding in 1983 on both Pigeon and Chicken Creeks were approximately a 50-year event.

Objective 1.1 Minimize future flood damage due to flooding east of Levan.

Action: Build dike structure up to divert flood
Time Frame: Depends on Funding
Funding: FEMA
Estimated Cost: $5,000
Staff: Public Works
Background: This area has the propensity for the ditches to overflow and would require buildup of the concrete wall.

Action: Nonstructural measures such as zoning are likely the most cost effective (see narrative for the county's mitigation above).
Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $25,000
Staff: County planning staff/contractual

Action: Potential structural mitigation includes debris basins on both Pigeon and Chicken Creeks and protection of the road and the Town's water line up Chicken Creek Canyon (if not already protected).
Time Frame: Depends on Funding
Funding: FEMA
Estimated Cost: The total cost structural measures would likely be between $2.4 million and $3 million.
Staff: Contractual
Background: Debris basins would alleviate flood damage to roads and water mains.

Problem Identification: Although there is a fairly large watershed east of town, the flood threat to Mona is fairly minimal since it is limited by the capacity of the culverts and underpass on Interstate 15. Currant Creek flows on the west side of town into Mona reservoir but these flooding sources also pose little threat so long as new development is not allowed to build adjacent to them, west of the railroad line.

Objective 1.2 Minimize future flood damage in Mona.

Action: Nonstructural measures such as zoning appears to be the most prudent approach (see narrative for the county's mitigation above) to minimize potential impacts from the eastside drainage, Currant Creek, and Mona Reservoir since the threat is relatively minor. No development should be allowed in the area west of the railroad tracks, which could be flooded by Currant Creek and/or Mona Reservoir.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $25,000.
Staff: TBD

Action: A structural action could consist of levees along the eastside drainage and constructing a dyke on the west side of town to prevent flooding from Currant Creek and Mona Reservoir.

Time Frame: Based on funding.
Funding: FEMA
Estimated Cost: about $400k
Staff: Contractual

Background: None

Objective 1.3 Minimize future flood damage due to flooding in Eureka

Action: Install curb, gutter and storm drain system in Eureka.

Time frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Background: None

Problem Identification: Utah's newest town, Rocky Ridge was incorporated only a few years ago. It is located just west of I-15, just south of the Utah/Juab County line. The community sits at the base of a hill amidst several small ravines. However, the contributing watershed above the community is relatively small so the potential for catastrophic flooding is minimal. There exists the potential for a FEMA No Special Flood Hazard Area (NSFHA) designation. It appears that the east/west streets may have been intentionally located at the ends of these ravines to handle some storm water runoff. For the majority of rainfall events, this will be adequate. A few homes near the mouths of the ravines may be at more substantial risk.

Objective 1.4: Minimize future flood damage in Rocky Ridge.

Action: New homes/structures should be sited so as to be away from the streets and low points. Efforts to evaluate these homes and flood proof as needed would be advisable.

Time Frame: Based on funding.
Funding: CIB/CDBG/FEMA
Estimated Cost: $20,000
Staff: County planning staff/Contractual

Background: On-site flood analysis to determine magnitude of hazard, i.e., mapping.

Problem Identification: Less than 10 percent of the county's population lives in unincorporated areas of Juab County. Many live in the area surrounding Nephi. Development should be avoided adjacent to Salt, Currant, Tanner and Cherry Creeks (and their tributaries) where the threat of flooding is present. Principle lakes/reservoirs include Yuba, Mona, and Chicken Creek; of these only Mona reservoir is listed as high hazard.

Objective 1.5: Minimize future flood damage in Unincorporated Juab County.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $25,000.
Staff: TBD

Action: New development near canals should also be discouraged. There have been several potentially deadly flood events in the state due to flooding caused by canal failures.

Time Frame: Depends on funding.

Funding: TBD
Estimated Cost: $25,000.
Staff: TBD
Background: None

Landslides

Goal 1 Reduce Risk of Damage due to Potential Landslides

Objective 1.1 Reduce structural damage due to landslides in new construction.

Action: Update zoning ordinances county-wide construction in identified landslide zones by ordinance

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County

Background: Utah County to the north has experienced alluvial landslides nearby.

Objective 1.2 Reduce structural damage due to landslides in existing buildings.

Action: Monitor landslide zones for movement threatening subdivisions to better warn inhabitants of danger.

Time frame: Depends on funding.
Funding: FEMA
Estimated Cost: TBD
Staff: Contractual

Background: None

Wildfire

Goal 1 Reduce Risk of Potential Fire

Objective 1.1 Reduce risk of damage by fire in Rocky Ridge.

Action: Construct Fire Break north and west of Rocky Ridge.

Time Frame: Depends on funding.
Funding: USFS/State Forestry, Fire, and State Lands
Estimated Cost: $100,000
Staff: Volunteers/Homeowners/State Forestry Staff

Action: Establish defensible space around at risk buildings in Rocky Ridge.

Time Frame: Depends on Funding
Funding: USFS/State Forestry, Fire, and State Lands
Estimated Cost: $30,000 per unit.
Staff: Volunteers/Homeowners/State Forestry Staff

Background: Rocky Ridge experienced a major grass fire recently that jeopardized the whole community.

Problem Soils

Goal 1 Reduce Risk of Damage due to Problem Soils

Objective 1.1 Reduce risk to new construction from problem soils

Action: Development in problem soil zones should be limited by ordinance.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County/Contractual

Background: Zoning appears to be the best way to mitigate the problem soils hazard.

Dam Failure

Goal 1 Reduce Risk of Dam Failure

Objective 1.1 Minimize damage to new and existing buildings due to Dam Failure

Action: Regularly monitor dams and strengthen them when necessary.

Time Frame: Depends on Funding

Funding: TBD

Estimated Cost: Monitoring is minimal to moderate; strengthening dams could be high.

Staff: TBD

Background: Juab County has two high hazard dams, Mona and Sevier Bridge. Their failure would threaten only sparsely populated areas of the county.

Appendix Q -- Millard County Mitigation Strategies

Note: Countywide in this document refers to a mitigation strategy benefiting the cities, towns and communities of: Robinson Ranch, Eskdale, Garrison, Gandy, Sugarville, Woodrow, Abraham, Lynndyl, Leamington, Oak City, Sutherland, Delta, Hinckley, Deseret, Oasis, Clear Lake, Greenwood, Black Rock, Holden, Scipio, Flowell, Fillmore, Meadow, Hatton, and Kanosh.

Dam Failure

County-wide

Problem Identification: Millard County has 14 dams with various amounts of impoundment. Most are earthen berm construction. Some would impact residential structures if failure occurred; all would have economic impact if lost.

Goal 1 – Priority HIGH

Objective 1.1 Reduce risk of catastrophic failure of dams

Action: Emergency Management active participation with Utah Department of Natural Resources on dam inspections

Time Frame: Ongoing
Funding: TBD
Estimated Cost: Minimal
Staff: Millard County Emergency Management & dam owners
Background: DNR annually inspects all dams within Millard County and suggests or mandates safety actions when necessary. With participation and follow up visits from local emergency management to ensure suggested and/or mandated actions are taken, dam owners may recognize local impact beyond loss of irrigation water.

Objective 1.2 Identify areas of impact

Action: Initiate review of dam inundation mapping to identify impact areas

Time frame: 3 years
Funding: TBD, possible FEMA grants
Estimated Cost: TBD
Staff: Emergency Management, Building Inspection, Planning/Zoning
Background: Current inundation maps need to be reviewed to make sure they reflect the risk.

Earthquake

County-wide

Problem Identification: Millard County has numerous identified earthquake faults, including populated areas.

Goal 1 - Priority MEDIUM

Objective 1.1 Reduce threat to population and structures from earthquake damage.

Action 1: Control new construction in known fault areas by ordinance and zoning

Time Frame: Ongoing

Funding: Existing planning/zoning budget funds, grants as identified and awarded

Estimated Cost: Minimal

Staff: Existing planning/zoning, Building Inspection, and Emergency Management departments

Background: Much of the identification of existing faults are identified and mapped in State of Utah and/or Federal Geologic surveys. Development of protective/restrictive ordinances to control building in those identified areas could be a natural extension of the above listed Millard County departments.

Action 2: Ban new construction within 100 feet of known fault lines by ordinance

Time Frame: Dependent on funding

Funding: Unknown

Estimated Cost: Unknown

Staff: County Building Officials, Planning and Zone, Attorney

Background: Land use ordinances have proven to be effect mitigation strategies

Action 3: Educate citizenry through existing Community Emergency Response Teams.

Time Frame: Ongoing

Funding: Millard County, DES/FEMA

Estimated Cost: $3,000

Staff: Millard County Emergency Management CERT Trainers

Background: Although an initial response to catastrophic damages/casualties may be limited by ongoing funding constraints, the citizenry can and is being educated to begin the process of taking care of themselves and neighbors until responders can be mobilized.

Objective 1.2 Minimize damage due to earthquake activity in existing buildings on faults

Action: Retrofit existing buildings on fault lines

Time frame: Dependant on funding available
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: Funding, costs, and staff requirements would be an unknown until these structures are identified as public, private, etc and the priorities determined.

Flooding

County-wide

Problem Identification: Many of Millard County residents, and much developed properties lie within the historic floodplain of the Sevier River and other streams in the county. This is mostly due to the need for water when the area was settled, and the agricultural background of the County.

Goal 1 – Priority HIGH

Objective 1.1 Identify and reduce flood risk in County

Action 1: Initiate flood plain mapping to identify threat areas based on historic and potential flood values that are currently mapped as Zone D. (Undetermined flood risk)

Time Frame: 1-3 years
Funding: FEMA-DES grants
Estimated Cost: TBD
Staff: Existing Planning/Zoning, Emergency Management
Background: Much information on historic and potential flooding on the Sevier River could be obtained from existing sources. Existing structures and exposures can be identified. Although it may not be possible to change the exposure on these existing properties due to private ownership, future development on the identified areas could be controlled through ordinance.

Action 2: Encourage 100 foot setbacks in areas of undetermined flood risk

Time Frame: 1-3 years
Funding: Unknown
Estimated Cost: Unknown
Staff: County Building Officials, County Planning and Zoning
Background: Defined setbacks will protect structures from flooding.

Objective 1.2 Encourage 100% participation in the National Flood Insurance Program (NFIP).

Action: Assist Town of Meadow in joining NFIP

Time Frame: 1 year
Funding: None required
Estimated Cost: None
Staff: County Emergency Management, County Engineer, State Floodplain Manager
Background: Town of Meadow has been mapped with Special Flood Hazard Areas, but does not participate in the NFIP. The community does not participate in the NFIP therefore flood insurance is not available.

Objective 1.3 Promote flood insurance throughout the County

Action: Create outreach document promoting flood insurance and include in local newspaper(s), libraries, and other public buildings.

Time Frame: 1 year
Funding: Minimal
Estimated Cost: Unknown
Staff: County Engineer, State Floodplain Manager, DES
Background: General public is usual not aware they can purchase flood insurance.

Objective 1.4 Reduce threat of unstable canals throughout the County. Identify County-wide canal systems

Action: Map and assess for structural integrity canal systems in the County

Time Frame: 3-5 years
Funding: Federal grants
Estimated Cost: Unknown
Staff: County Engineer, County Public Works, County Information and Technology, County Emergency Management
Background: Private and Public canals are used for transportation and dispersion of water as well as flood control.

Objective 1.5 Ensure EOC(s) are equipped to respond to flooding.

Action: Obtain communication equipment that will allow for timely response to flooding.

Time Frame: 1 year
Funding: Federal Grants
Estimated Cost: $30,000
Staff: County Sheriff, County Emergency Management
Background: An alternate EOC is being considered in Kamas. Adequate communication capabilities is essential between all response agencies within the County.

Objective 1.6 Official recognize Lynndyl as a FEMA NSFHA

Action: With FEMA approval, draft and adopt a NSFHA Flood Loss Prevention Ordinance

Time Frame: Dependent on FEMA review and approval
Funding: None required
Estimated Cost: None
Staff: County, Town, and State Floodplain Manager

Severe Weather

County-wide

Problem Identification: Millard County is subject to severe weather such as; summer thunderstorms, hail, winter storms causing temporary closure of the Interstate Highway System, windstorms causing property damage and closing of highways. These types of storms, although of relatively short duration, usually initiate the impact with little or no warning to the citizens and traveling public. In addition to the obvious possibility of property damage and injury to persons, these storms impact communities in the County with sheltering needs for displaced travelers.

Goal 1 – Priority HIGH

Objective 1.1 Increase planning, warning and sheltering capabilities for highways and communities in Millard County

Action: Continue ongoing planning efforts through existing Local Emergency Planning Committee with representatives from communities, Red Cross, Utah Department of Transportation, etc.

Time Frame: Ongoing, this committee currently meets on odd numbered months
Funding: Existing funding streams from impacted public agencies, grants as identified
Estimated Cost: Minimal
Staff: Existing staff
Background: Much of the response necessary for response to these types of incidents exists, although in a fractured state between the individual agencies/parties. Ongoing planning, communication and coordination through a group effort using the existing LEPC will streamline the processes and materials necessary to have an efficient, safe and coordinated response to these types of occurrences.

Objective 1.2 Protect County from adverse affects of severe weather

Action 1: County participate in the StormReady program.

Time Frame: 2 Year
Funding: State and Federal
Estimated Cost: Unknown
Staff: City and County Emergency Management
Background: Set up within the county emergency management and encourage all cities to participate, all requirements of the National Weather Service StormReady program.

Action 2: Assess EOCs to ensure they are grounded lightning, to include buildings with towers, etc.

Time Frame: 2-3 years
Funding: Federal Grants
Estimated Cost: Unknown
Staff: County Emergency Management
Jurisdictions: Countywide
Background: Alternate EOC(s), Sheriff's Dispatch, Command Vehicle(s)and associated equipment need to be protected from severe weather events including lightning

Objective 1.3 - Reduce risk of damage to windstorms in Hinckley, Lynndyl and Oak City

Action: Plant trees west of the Towns to serve as a windbreak

Time Frame: Depends on funding source
Funding: Unknown
Estimated Cost: Unknown, depends on scope of project
Staff: Unknown
Background: This will serve as a natural wind buffer

Infestation

County-wide

Problem Identification: Infestation by Mormon Crickets and grasshoppers damaging agriculture and private property.

Goal 1 – Priority HIGH

Objective 1.1 Minimize property damage due to infestation.

Action: Reduce numbers of Mormon Crickets/grasshoppers through the use of oison bait on adjacent State/Federal lands.

Time Frame: Ongoing
Funding: Millard County, State, and Federal
Estimated Cost: $10,000

Staff: Existing State/Federal, Private landowners
Background: Millard County agricultural producers and landowners suffer from a cyclical infestation of Mormon Crickets. Some success has been noted by involving agencies controlling adjacent lands in baiting the insects, at the proper time in their life cycle, through a coalition of government and private applications of the bait.

Drought

County-wide

Problem Identification: Cyclical periods of drought place a strain on community culinary water resources.

Goal 1 – Priority HIGH

Objective 1.1 Conserve culinary water by educating the public

Action 1: Educate the public on the need to be water wise
Time Frame: Ongoing
Funding: State and Federal
Estimated Cost: Minimal
Staff: Water Districts
Background: Use a newsletter to educate the public

Action 2: Coordinate with current water systems and develop a secondary water systems plan for drought
Time frame: Immediate
Funding: Undetermined local sources
Estimated Cost: Minimal
Staff: Water Districts
Jurisdictions: Countywide
Background: To reduce the demand on culinary systems it is proposed that more communities study the possibility of using secondary water for agricultural uses such as irrigation and lawn watering.

Wildfire

County-wide

Problem Identification: Millard County has a Moderate wildfire risk in the County. Areas of concern include: Delta, Leamington, Holden and Scipio. Range fires are also of concern.

Goal 1 – Priority - HIGH

Objective 1.1 - Reduce threat and impact of wildland fire at the local level

Action: Create community fire safe councils and implement the "Community Fire Planning" process.

Time Frame: On going
Funding: Obtain grant monies and alternative sources of funding through various grants and foundation.
Estimated Cost: $5,000.00 per plan
Staff: Unknown
Background: The "Community Fire Planning" process was implemented through the Utah Division of Forestry, Fire, and StateLands in support of on-going efforts under the National Fire Plan to educate and empower landowners to take action to reduce the threat of wildfires within a community.

Objective 1.2 - Develop fuel modification program

Action: Implement fuel modification program and projects

Time Frame: On going
Funding: Grants and private landowners
Estimated Cost: Variable based on acreage and type of materials being removed.
Staff: State, County, Cities, Towns and residents
Background: Through the creation of defensible space in and around communities, the threat of catastrophic wildfires will be greatly reduced.

Objective 1.3 – To educate and inform the community of fire prevention

Action: Develop and implement community outreach fire prevention program

Time Frame: Immediate and on going
Funding: Unknown
Estimated Cost: $5,000.00 per year
Staff: County Planning and Zoning, Building Department, Fire Warden
Background: Education is the key to informing homeowners about the risk of wildfires. Through a comprehensive education, program homeowners can take action independent to protect values at risk and understand the effects of wildfires.

Landslides

County-wide

Problem Identification: Landslides most often occur during spring months with higher than normal amounts of precipitation in the area of the Pahvant Valley in eastern Millard County

Objective 1.2- Obtain better and more detailed in areas of landslides

> **Action:** Required Geological and Geotechnical reports for any proposed developments in the designated landslide areas with the possibility of independent reviews of the reports.
>
> > **Time Frame:** With development engineering plans for the area
> > **Funding:** Developer
> > **Estimated Cost:**
> > **Staff:** Licensed Geology and Geotechnical Firms
> > **Background:** This should be required through an Ordinance.

Objective 1.3- Ensure development in areas of landslide concern are protect utilizing scientific data.

> **Action:** Require developers to install developments according to recommends for the Geological and Geotechnical reports provided and approved.
>
> > **Time Frame:** As landslide areas develop
> > **Funding:** Developer
> > **Estimated Cost:**
> > **Staff:** Developer and Contractor

Problem Soils - Regional

Appendix R -- Piute County Mitigation Strategies

Note: Countywide in this document refers to a mitigation strategy benefiting the towns of: Circleville, Junction, Kingston, and Marysvale.

Earthquake

Goal 1 Reduce Risk of Damage due to Earthquake

Objective 1.1 Reduce structural damage from potential earthquakes in new buildings.

Action: Enforce Uniform Building Code on new construction countywide.

Time Frame: Continual
Funding: County
Estimated Cost: TBD
Staff: County

Background: None

Action: Control new construction in known fault areas by ordinance and zoning.

Time Frame: Continual
Funding: TBD
Estimated Cost: $20,000
Staff: County/Contractual

Background: None

Objective 1.3 Reduce structural damage due to potential earthquake in existing buildings.

Action: Identify and retrofit existing buildings at risk of damage from earthquake.

Time frame: Depends on funding.
Funding: TBD
Estimated Cost: Unknown
Staff: TBD

Background: None

Flood

Goal 1 Reduce Risk of Potential Flooding

Municipalities: Three of the 4 incorporated communities in Piute County - Circleville, Junction, and Kingston have a relatively minor risk of flooding from the Sevier River and its tributaries. Marysvale, however, has an extensive history of flooding.

Problem Identification: Marysvale has an extensive history of flooding from Bullion (Pine) Creek and a high future flood threat - even greater than that shown on the FEMA map (see attached). The 100-year flow has been estimated at almost 900 cfs. There are also smaller threats from Beaver Creek on the north side of town and California Gulch through the center of town.

Objective 1.1: Minimize future flood damage in Marysvale.

Action: Construct a detention basin on Bullion Creek if a suitable site can be identified.

Time Frame: TBD
Funding: FEMA
Estimated Cost: $300k
Staff: Contractual

Action: Construct flood control channel to divert flood from Revenue Gulch over to Bullion Creek.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Background: Marysvale has seen several floods, which these projects would effectively mitigate.

Objective 1.2 Minimize future flood damage due to flooding in Circleville.

Action: Construct flood control dykes between Circleville and Sevier River

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Action: Dredge Sevier River near Circleville.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Background: None.

Objective 1.3 Minimize future flood damage due to flooding in Kingston.

Action: Construct flood control pond in Kingston Canyon.
Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None.

Problem Identification: Only about 16 percent of the county's population lives in unincorporated areas of the county. Development should be avoided adjacent to Sevier River and Otter Creek (and their tributaries) where the threat of flooding is greatest. The FEMA Piute County FIRMs identify most areas as Zones C or X (little to no flood threat) with the areas adjacent to the rivers and creeks identified as Zone A – 100 year flood risk. The State Division of Water Resources, Dam Safety Section indicates there are four high hazard dams within Piute County. Although Piute County is small in both area and population size standards the majority of population lives below and within about thirty miles of the Otter Creek or Piute Dams both of which are considered high hazard.

Objective 1.4: Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population, which will oppose any zoning or other changes in the regulations and ordinances.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: $25,000
Staff: Contractual

Landslides

Goal 1 Reduce Risk of Damage due to Potential Landslides

Objective 1.1 Reduce structural damage due to landslides in new construction.

Action: Control new construction in identified landslide zones by ordinance

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County

Background: None.

Objective 1.2 Reduce casualties due to landslides by having better warning system.

Action: Monitor landslide areas for movement.

Time frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Background: None

Wildfire

Goal 1 Reduce Risk of Potential Fire

Objective 1.1 Reduce risk of damage by fire in Bullion Canyon (Marysvale).

Action: Establish defensible space around at risk buildings in Bullion Canyon.

Time Frame: Depends on funding.
Funding: National Fire Plan
Estimated Cost: TBD
Staff: TBD

Background: The Bullion Canyon community is currently organizing a fire planning committee in order to write a community fire plan facilitated by Six County AOG Planning Staff.

Problem Soils

Goal 1 Reduce Risk of Damage due to Problem Soils

Objective 1.1 Reduce risk to new construction from problem soils

Action: As better data becomes available, control new construction in problem soil zones by ordinance.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County

Background: None

Dam Failure

Goal 1 Reduce Risk of Dam Failure

Objective 1.1 Minimize damage to new and existing buildings due to Dam Failure

Action: Regularly monitor dams and strengthen them when necessary.

Time Frame: Depends on Funding

Funding: TBD

Estimated Cost: Monitoring is minimal to moderate; strengthening dams could be high.

Staff: TBD

Background: The Utah Department of Natural Resources annually inspects all dams within Piute County and suggests or mandates safety actions when necessary.

Appendix S -- Sanpete County Mitigation Strategies

Note: Countywide in this document refers to a mitigation strategy benefiting the cities, towns and communities of: Manti, Ephraim, Moroni, Fountain Green, Wales, Mayfield, Mt Pleasant, Spring City, Gunnison, Centerfield, Sterling, Fayette, Fairview

Wildfire Urban Interface

County-Wide

Problem Identification: Wild land fires are becoming a greater threat to the community as Sanpete County continues its growth and expansion into wild land areas. Wild land fires are one of the biggest threats to the loss of life, property and natural resources located in Sanpete County. The probability is high and impact of a wild land fire in many parts of our county would be catastrophic therefore the rating for this occurrence will be high on the Risk Assessment Summary.

Goal 1 – Priority - HIGH

Objective 1.1

Action: Public Education and Awareness

Time Frame: 5 Years
Funding: Healthy Forest Initiative, National Fire Plan, Sanpete County
Estimated Cost: $25,000 over five years
Staff: County Fire Warden and Emergency Manager, State Fire, and Forest Service
Background: The county Fire Warden and County Emergency Manager are engaged in this education process now but can not addrees it to the level it requires.

Objective 1.2

Action: Wild Land Fire Zoning Ordinances

Time frame: 5 Years
Funding: Sanpete County
Estimated Cost: 5,000
Staff: County Zoning Committee, County Commissioners, County Fire Warden, and County Emergency Manager
Background: We currently have a dry subdivision ordinance is in effect.

Objective 1.3

Action: Mitigation of existing hazards like defendable space, road width and escape routes.

Time Frame: 15 years
Funding: Health Forest Initiative and National Fire Plan
Estimated Cost: $10,000,000 over 15 years
Staff: Forest Service, State and County Fire Warden, Home Owner Associations, State and County Emergency Management.
Background: The county has begun but have a long way to go and will also require the a level of maintenance.

Earthquake

County-Wide

Goal 1 – Priority - MEDIUM

Problem Identification: One of Sanpete County's natural hazard threats with the potential for catastrophic consequences is a large earthquake. Earthquakes on the Gunnison Fault of a 6.5 rating or greater occur on average of once every 500 + years. Earthquakes on the Wasatch Fault that extends into Nephi appear to have a grater potential for being larger. It is estimated that 7 + rated quakes occur in this area every 1500 to 3000 years. Sanpete County is at risk from both faults. The last large earthquake took place on the Nephi segment approximately 400 years ago. We estimate that the probability of the event greater than 6.5 would be low and the consequences to building loss to be high especially due to the large amount of mobile homes and non-reinforced block buildings in the area. Analysis done by the State of Utah shows a low probability for high losses of life. However, this data is based on computer models and could be inaccurate for a specific event. Due to the large areas affected by earth quakes and the amount of devastation that can occur earthquakes will be given a moderate risk rating on the Risk Assessment Matrix.

Objective 1.1

Action: Education of General Public
Time Frame: Ongoing
Funding: Division of Emergency Services, Local School Districts, Emergency Management.
Estimated Cost: $2,000 per year
Staff: teachers, emergency manager and state earthquake staff
Background: We use the program provided us by the state in which we have our school teachers teach the class to 5th graders in the county.

Objective 1.2

Action: Developing CERT teams in the county.
Time Frame: 5 years
Funding: State DES, County Emergency Management, and Local School Districts
Estimated Cost: $3,000 per year
Staff: DES Earthquake Representatives, Instuctors, Members of the community and County Emergency Manager
Background: We have trained a few Citizen Emergency Response Teams.

Objective 1.3

Action: Retrofit high risk public buildings and churches
Time Frame: Unknown
Funding: Unknown
Estimated Cost: To be determined
Staff: Building inspectors, Emergency Manager, County Zoning and Commission
Background: None

Slope Failure and Flooding

County-Wide

Goal 1 – Priority - HIGH

Problem Identification: In terms of loss of life, the greatest flood risk in Utah is associated with flash floods, which cascade down steep mountain canyons with little or no warning. However, in terms of property damage and loss, the greatest flood threat occurs when mountain canyons discharge water, mud and debris resulting from heavy rain and/or rapid snow pack melting.

The most dramatic example of flooding occurred in the Springs of 1983 and 1984. Several streams coming from the mountain canyons, discharged water, mud and debris as a result of heavy Spring rains and rapid melting of the snow pack. Landslides, mudslides and high runoff resulted in over 750 million in property loss and three deaths in the state during that period.

During this period of flooding, the Great Salt Lake reached a historic high of 4210 feet above sea level. Historically the lake reached a high of 4211.5 feet above sea level in 1873 and an historic low of 4191.35 in 1963.

Following those floods, several mitigation projects have been undertaken to minimize damage from similar scenarios. Catch basins, flood dams, and diversions have been constructed at the mouths of some of the canyons to catch future debris flows or flash floods. The spill way at the Gunnison Reservoir has also been significantly improved. Flash flooding from thunderstorms does occur from time to time, but that threat is highly localized. In Utah, over 360 flash floods and more than 170 snow melt floods have occurred since 1853. Since 1950, floods and flash floods have killed 25 people, making such floods the second greatest weather-related killer in the state (after lightning). In Utah, flash floods typically occur when slow moving thunderstorms produce torrential rainfall. These floods can roll boulders, uproot trees, wash away roads and automobiles, destroy buildings and bridges and scour out new channels. Rapidly rising water can reach heights of 30 feet or more. Furthermore, flash flood-producing rains can also trigger catastrophic mudslides. Often there is no warning that these sudden, deadly floods are coming. Floods and mud streams will continue to plague our area and have as recently as 1999 with the floods in Spring City, Utah and the land slide in the Narrows up 12 Mile Canyon above Mayfield. There are approximately 600 landslide areas identified in Utah.

These occurrences topically create a significant hazard for those individuals that are in the immediate area and past history has shown that the threat to property loss is greater than the treat to human life. The assessment is that the probability for the floods and mudslides is high but the consequences are usually restricted limited areas and has a relatively low risk for loss of life. The risk has been assessed as Moderate for these events.

Goal 2 – Priority HIGH

Problem Identification: More detailed information is needed to assess risk and to develop land use mitigation measures.

Objective 1.1

Action: Educate the County Commissioners

Time Frame: 5 Years
Funding: Emergency Management, State and Federal Gov.
Estimated Cost: $10,000 over 5 years
Staff: Emergency Management Director
Background: Little has been done.

Objective 1.2

Action: Conduct a professional analysis of areas of highest risk.

Time Frame: 5 Years
Funding: Undetermined
Estimated Cost: $100,000
Staff: Independent Contractor and Emergency Manager
Background: This has been done in several specific areas but

should be done for the whole county.

Objective 1.3

Action: Restrict development in land slide, debris flow and flood areas or provide for diversion structures when viable.

Timeframe: 5 Years
Funding: Undetermined
Estimated Cost Undetermined
Staff: County Commissioners, County Zoning, City Councils and Zoning Emergency Manager and Building Inspectors Office.
Background: Some areas have been analyzed and structures have been built.

Goal 2 – Priority HIGH

Problem Identification: Reduce flood losses due to flooding

Objective 1.1 Encourage 100% participation in the National Flood Insurance Program (NFIP).

Action: Assist Town of Fountain Green, Town of Wales, Town of Centerfield, Town of Sterling, Town of Fayette and the Town of Mayfield in joining NFIP

Time Frame: 1 year
Funding: None required
Estimated Cost: None
Staff: County Emergency Management, County Floodplain Administrator, State Floodplain Manager
Background: FEMA has yet to map the Town of Fountain Green, Town of Wales, Town of Centerfield, Town of Sterling, and the Town of Fayette Town of Fountain Green with Special Flood Hazards (SFHA). These communities do not participate in the NFIP therefore flood insurance is not available. The Town of Mayfield has mapped Special Flood Hazard Areas (SFHAs), but does not participate in the NFIP.

Objective 1.2 Promote flood insurance throughout the County

Action: Create outreach document promoting flood insurance and include in local newspaper(s), libraries, and other public buildings.

Time Frame: 1 year
Funding: Minimal
Estimated Cost: Unknown
Staff: County Floodplain Administrator, State Floodplain Manager, DES
Background: General public is usual not aware they can purchase flood insurance.

Objective 1.3 Reduce threat of unstable canals throughout the County. Identify County-wide canal systems

Action: Map and assess for structural integrity canal systems in the County
Time Frame: 3-5 years
Funding: Federal grants
Estimated Cost: Unknown
Staff: County Engineer, County Public Works, County Information and Technology, County Emergency Management

Background: Private and Public canals are used for transportation and dispersion of water as well as flood control.

Objective 1.4 Reduce flooding threat in Fairview, Mt. Pleasant, Gunnison, Mayfield, Ephraim, Sterling, Fayette, Wales, Fountain Green, Spring City, Moroni, and Manti.

Action: Clear debris and other material from streams prior to spring snow melt.
Time Frame: Ongoing
Funding: None
Estimated Cost: Unknown
Staff: County Public Works
Background: Most flooding is attributed to debris-laden streams.

Objective 1.5 Ensure EOC(s) are equipped to respond to flooding.

Action: Obtain communication equipment that will allow for timely response to flooding.
Time Frame: 1 year
Funding: Federal Grants
Estimated Cost: $30,000
Staff: County Sheriff, County Emergency Management
Background: Alternate EOCs need to be considered during flood events.. Adequate communication capabilities is essential between all response agencies within the County.

Objective 1.6 Support updating of flood hazard data

Action: Support and encourage participation in the NFIP Flood Map Mod Program.
Time Frame: Ongoing
Funding: Federal
Estimated Cost: Unknown
Staff: County Floodplain Administrator County Engineer, State Floodplain Manager

Background: Accurate flood maps assist the County in the administration of the NFIP and better reflects flood risk within the County.

Severe Weather

County-Wide

Goal 1 – Priority - HIGH

Problem Identification: Snowstorms, summer thunderstorms, hail, and high winds over central Utah have a dramatic effect on regional commerce, transportation, and daily activity and are a major forecast challenge for local meteorologists.

Objective 1.1 Protect County from adverse affects of severe weather

Action 1: County participate in the StormReady program.
Time Frame: 2 Year
Funding: State and Federal
Estimated Cost: Unknown
Staff: City and County Emergency Management
Background: Set up within the county emergency management and encourage all cities to participate, all requirements of the National Weather Service StormReady program.

Action 2: Encourage avalanche preparedness for county backcountry users.
Time Frame: 1 Year
Funding: Minimal
Estimated Cost: Minimal
Staff: County Emergency Management State Hazard Mitigation Team members, Utah Avalanche Forecast Center.
Jurisdictions: Countywide
Background: Avalanches and avalanche preparedness is not often considered when discussing mitigation on the county or city level, yet several people die each year in Utah's backcountry. While the avalanche terrain is mainly on US Forest Service land the search and rescue for the lost individual in more often than not coordinated by emergency managers with search parties comprised of county and city staff. Introductory avalanche awareness training could lessen the costs to Sanpete County and the cities within the county. Most avalanche victims die in avalanches started by themselves or someone in there party. Thus, education can limit the number of avalanche related searches each year.

Action 3: Assess EOCs to ensure they are grounded lightning, to include b uildings with towers, etc.
Time frame: 2-3 years
Funding: Federal Grants
Estimated Cost: Unknown

Staff: County Emergency Management
Jurisdictions: Countywide
Background: Alternate EOCs, Sheriff's Dispatch, Command Vehicle(s)and associated equipment need to be protected from sever weather events including lightning.

Drought

County-Wide

Problem Identification: Cyclical periods of drought place a strain on community culinary water resources.

Goal 1 – Priority LOW

Objective 1.1 Conserve culinary water by educating the public

Action 1: Educate the public on the need to be water wise
Time Frame: Ongoing
Funding: State and Federal
Estimated Cost: Minimal
Staff: Water Districts
Background: Use a newsletter to educate the public

Action 2: Coordinate with current water systems and develop a secondary water systems plan for drought
Time frame: Immediate
Funding: Undetermined local sources
Estimated Cost: Minimal
Staff: Water Districts
Jurisdictions: Countywide
Background: To reduce the demand on culinary systems it is proposed that more communities study the possibility of using secondary water for agricultural uses such as irrigation and lawn watering.

Appendix T -- Sevier County Mitigation Strategies

Note: Countywide in this document refers to a mitigation strategy benefiting the cities and towns of: Annabella, Aurora, Elsinore, Glenwood, Joseph, Koosharem, Monroe, Redmond, Richfield, Salina, and Sigurd.

Earthquake

Goal 1 Reduce Risk of Damage due to Earthquake

Objective 1.1 Minimize damage and casualties due to earthquake throughout county including the Koosharem Band of the Paiute Tribe of Utah.

Action: Public education and regular earthquake drills

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: County/Tribal Emergency Mgmt.

Background: Elsinore was the site of a 6.0 Richter Magnitude earthquake in 1921. Picture 1 on p.3 of *Annex 6* shows some of the earthquake's damage.

Objective 1.2 Reduce structural damage from potential earthquakes in new buildings.

Action: Enforce Uniform Building Code on new construction throughout county.

Time Frame: Continual
Funding: County
Estimated Cost: TBD
Staff: County

Action: Update zoning ordinances to avoid new construction within 100 feet of known fault lines.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County/Contractual

Background: None

Objective 1.3 Reduce structural damage due to potential earthquake in high risk buildings throughout county.

Action: Identify and retrofit high-risk public buildings and churches at risk of damage from earthquake.

Time frame: Depends on funding.
Funding: Unknown
Estimated Cost: $100,000,000
Staff: Emergency Mgr., State, and Contractual.

Background: None

Flood

Goal 1 Reduce Risk of Potential Flooding

Problem Identification: Sevier County is one of the few counties in the state where every municipality participates in the NFIP. Only about 18 percent of this county's population lives in unincorporated areas of the county. Development should be avoided adjacent to the Sevier and other major rivers and creeks (and their tributaries) where the threat of flooding is greatest. The FEMA FIRMs identify most areas as Zones C and X (little to no flood threat) with the areas adjacent to the rivers and creeks identified as Zone A – 100 year flood risk. Lakes/Reservoirs include: Fish Lake, Johnson Valley, Koosharem, Rocky Ford, and Forsyth.

Objective 1.1 Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the county to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances

Timeframe: Depends on Funding
Funding: TBD
Estimated Cost: Minimal – almost nothing.
Staff: County/Contractual
Background: None

Problem Identification: Koosharem Creek has a rather large drainage area of several square miles at Koosharem. According to the USGS quadrangle map, there is a weir/aqueduct diversion about 2 miles upstream of town.

Objective 1.2 Minimize future flood damage from Koosharem Creek through Koosharem.

Action: Improve existing dike along Koosharem Creek
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: about $300,000
Staff: Contractual
Background: Raise and extend the existing dike along the east side of town for a distance of approximately 6,000 ft. (Provisions will need to be made for low

flows to enter the Koosharem Canal and riprap at the south end of the levee where diverted flood flows will pass.)

Problem Identification: Monroe Creek with a drainage area of 39 square miles at Monroe. Monroe Creek has the potential of causing flood damage below Bohman Road, because of decreased channel capacity and constrictions. Constrictions include the culvert at Jones Road, and bridges at Jones Road, 8th South and 4th south.

Objective 1.3 Minimize future flood damage along Monroe Creek through Monroe City.

Action: Modify bridges along Monroe Creek
- **Timeframe:** Depends on Funding
- **Funding:** TBD
- **Estimated Cost:** TBD
- **Staff:** Contractual

Background: Enlarge or add to bridges especially Jones Road Bridge to increase the channel capacity to at least match the capacity of the Bohman Road bridge.

Action: Maintain and improve existing levee along Monroe Creek
- **Time Frame:** Depends on Funding
- **Funding:** TBD
- **Estimated Cost:** Minimal
- **Staff:** Unknown

Background: Flatten the side slopes, filling in depressions and rodent holes, and removing any deep-rooted plants along the levee. Fill and protect locations where the levee is eroded with riprap or other armoring.

Action: Inform residents of the availability of flood insurance
- **Timeframe:** Immediate
- **Funding:** TBD
- **Estimated Cost:** Minimal
- **Staff:** County/Contractual

Background: None

Problem Identification: Salina Creek has the potential of causing flood damage with in the City of Salina. Approximately 35 structures could be affected by a 100-year flood event. The majority of these structures are singe-family residences and a few small businesses. The Mayor of Salina indicated very little new development had occurred on the west side of town primarily due to the flood threat. The existing levee and channel appear to provide some flood protection. However some minor damage would take place for an event with a frequency of 50-years.

Objective 1.4 Minimize future flood damage along Salina Creek through Salina City.

Action: Maintain and improve existing levee along Salina Creek
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: Minimal
Staff: Unknown
Background: Flatten the side slopes, filling in depressions and rodent holes, and removing any deep-rooted plants along the levee. Fill and protect locations where the levee is eroded with riprap or other armoring.

Action: Maintenance of channels and bridge openings
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: Minimal
Staff: Unknown
Background: Keep all bridge openings and upstream channels free of debris to prevent constriction during high flows.

Objective 1.5 Minimize future flood damage due to flooding in Aurora

Action: Strengthen canal, which mitigates flooding since it catches spring runoff.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Action: North of Aurora-build UDOT bridge above state canal.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Objective 1.6 Minimize future flood damage due to flooding in Koosharem

Action: Perform a Flood Engineering Study for Koosharem
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None.

Objective: 1.7 Minimize future flood damage due to flooding in Glenwood

Action: Rebuild flood retention ponds in Glenwood
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Action: Update flood map-resurvey
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Objective 1.8 Minimize future flood damage due to flooding in Joseph

Action: Construct concrete barriers and built up beams in Joseph
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Objective 1.9 Minimize future flood damage due to flooding on culverts near Salina

Action: Upgrade existing culverts to mitigate flood.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Objective 1.10 Minimize future flood damage due to flooding in Redmond

Action: Install storm drain system in Redmond
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Objective 1.11 Minimize future flood damage due to flooding in Richfield

Action: Maintain flood retention walls for Richfield
Time Frame: Depends on Funding

Funding: TBD
Estimated Cost: TBD
Staff: TBD

Action: Upgrade storm drain system
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Objective 1.12 Minimize future flood damage due to flooding down Bertelson Canyon.

Action: Construct small debris basin in Bertelson Canyon to mitigate flooding in Monroe.
Time Frame: Depends on Funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Landslides

Goal 1 Reduce Risk of Damage due to Potential Landslides

Objective 1.1 Reduce structural damage to new construction due to landslides.

Action: Update zoning ordinances to avoid new construction in identified landslide zones.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County/Contractual

Background: None

Objective 1.2 Reduce structural damage and casualties due to landslides in existing buildings.

Action: Monitor landslides for movement in order to warn inhabitants of impending danger.

Time frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Background: None

Wildfire

Goal 1 Reduce Risk of Potential Fire

Objective 1.1 Reduce risk of damage by fire.

Action: Establish defensible space around at risk buildings and educate communities about "Living with Fire" program.

Time Frame: Depends on Funding
Funding: National Fire Plan
Estimated Cost: Minimal
Staff: TBD

Background: Six County AOG Planning Staff are currently facilitating the organization of community fire councils for Monroe Mountain (east of Monroe), Burrville (north of Koosharem), and Daniels Canyon/Sevenmile area (northeast of Koosharem) in order to write fire plans.

Problem Soils

Goal 1 Reduce Risk of Damage due to Problem Soils

Objective 1.1 Reduce risk to new construction from problem soils

Action: Update county/municipal zoning ordinances to avoid new construction in problem soil zones.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000 per jurisdiction
Staff: County/Municipal/Contractual

Background: None

Dam Failure

Goal 1 Reduce Risk of Dam Failure

Objective 1.1 Minimize damage to new and existing buildings due to Dam Failure

Action: Regularly monitor dams and strengthen them when necessary.

Time Frame: Depends on Funding

Funding: TBD

Estimated Cost: Monitoring is minimal to moderate; strengthening dams could be high.

Staff: TBD

Background: The Utah Department of Natural Resources annually inspects all dams within Sevier County and suggests or mandates safety actions when necessary.

Appendix U -- Wayne County Mitigation Strategies

Note: Countywide in this document refers to a mitigation strategy benefiting the towns of: Bicknell, Hanksville, Loa, Lyman, and Torrey.

Earthquake

Goal 1 Reduce Risk of Damage due to Earthquake

Objective 1.1 Reduce structural damage from potential earthquakes in new buildings.

Action: Enforce Uniform Building Code on new construction throughout county.

Time Frame: Continual
Funding: County
Estimated Cost: TBD
Staff: County

Action: Update zoning ordinances to avoid new construction within 100 feet of known fault lines.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County/Contractual

Background: None

Objective 1.2 Reduce structural damage due to potential earthquake in existing buildings.

Action: Identify and retrofit high-risk public buildings and churches at risk of damage from earthquake.

Time frame: Depends on funding.
Funding: Unknown
Estimated Cost: $20,000,000
Staff: Emergency Mgr., State, and Contractual.

Background: None

Flood

Goal 1 Reduce Risk of Potential Flooding

Problem Identification: Almost 40 percent of this county's population lives in unincorporated areas of the county. Development adjacent to the Dirty Devil and Fremont Rivers (and their tributaries) should be prevented. Areas adjacent to Green River are protected from development for the most part by Canyonlands National Park. There are no FEMA FIRMs for the unincorporated areas of the County although there are areas of risk. There are three high hazard dams, which would impact Wayne County, if failure were to occur. Two of these dams, Johnson Dam and Forsythe Dam, are physically located in Sevier County adjacent to the Wayne County line and upstream on the Fremont River from the third dam Mill Meadow, which is located in Wayne County. The possibility exists for failure of one dam resulting in failure of downstream dams. Wayne County is very large in area and very small in populations, however the majority of the population does live below and within about thirty miles of the above-mentioned dams and within a few miles of the Fremont River and its flood plain.

Objective 1.1 Minimize future flood damage in the unincorporated county.

Action: Nonstructural measures appear to be the most prudent option for the County to implement in the unincorporated areas. Zoning to prevent development of structures near all rivers, creeks, and lakes would be prudent (100 ft minimum setback or greater) as well as not allowing development on alluvial fans. New development near canals should also be discouraged, as there have been several potentially deadly flood events in the state due to flooding caused by canal failures. The cost of modifying county regulations and ordinances to include these recommendations is minimal and the benefits substantial. It should be anticipated that there would be a small percentage of the population that will oppose any zoning or other changes in the regulations and ordinances

Timeframe: Depends on Funding
Funding: TBD
Estimated Cost: Minimal – almost nothing.
Staff: County/Contractual

Problem Identification: There is a major flood threat in Hanksville from Bull Creek – especially on the east side of town. The town has made some channel improvements but the culvert and crossing at Highway 24 is offset from the flow line of the channel by 6 ft or more (according to the city engineer). UDOT is looking into this problem.

Objective 1.2 Minimize future flood damage due to flooding in Hanksville.

Action: Install larger pipe on Bull Creek in Hanksville.

Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Action: Upgrade flood dyke that drains into Bull Creek.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Action: Improve drainage system to prevent flooding in town.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: Flooding occurs on both Bull Creek and in the town itself after a heavy monsoonal rain.

Action: Culvert improvements are needed at Highway 24 and additional channel work. Another alternative would be about 1 mile of levee.
Timeframe: Depends on Funding
Funding: TBD
Estimated Cost: On the order of $0.5 to $1 million.
Staff: UDOT/Contractual
Background: None

Problem Identification: There is a moderate flood threat from the unnamed drainages to the east of Lyman Town.

Objective 1.3 Minimize future flood damage in Lyman.

Action: Construct new reservoir to prevent flooding in Lyman
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Alternative Action: There is a High Line Ditch located between the town and the east side drainages. It appears that the ditch when needed could convey some floodwaters. A structural project could consist of improving this ditch to increase its capacity.
Timeframe: Depends on Funding
Funding: TBD
Estimated Cost: Approximately $300,000.
Staff: Contractual

Alternative Action: An alternative structural project could consist of constructing about a mile long deflector levee.
Timeframe: Depends on Funding
Funding: TBD

Estimated Cost: Approximately $300,000.
Staff: Contractual
Background: None

Objective 1.4 Minimize future flood damage due to flooding on Sand Creek near Torrey.

Action: Span culinary water lines over Sand Creek to avoid flood damage to lines.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: Previous floods have washed out culinary water lines.

Objective 1.5 Minimize future flood damage due to flooding north of Bicknell

Action: Construct culverts to prevent washing out north of Bicknell.
Time Frame: Depends on Funding
Funding: TBD
Estimated Cost: TBD
Staff: TBD
Background: None

Need for Additional Research

Additional research should be conducted to better map communities currently mapped as a FEMA Zone D, or currently unmapped communities, and communities with out dated Flood Insurance Rate Maps. Communities would benefit from knowing peak flows and stages on tributaries of concern.

Landslides

Goal 1 Reduce Risk of Damage due to Potential Landslides

Objective 1.1 Reduce structural damage to new construction due to landslides.

Action: Update zoning ordinances to avoid new construction in identified landslide zones.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000
Staff: County/Contractual

Background: None

Objective 1.2 Reduce structural damage due to landslides in existing buildings.

Action: Remove existing buildings from landslide zones; Resettle population in safer zone.

Time frame: Depends on funding.
Funding: TBD
Estimated Cost: TBD
Staff: TBD

Background: None

Wildfire

Goal 1 Reduce Risk of Potential Fire

Objective 1.1 Reduce risk of damage by fire.

Action: Establish defensible space around at risk buildings and educate communities about "Living with Fire" program.

Time Frame: Depends on Funding
Funding: National Fire Plan
Estimated Cost: Minimal
Staff: TBD

Background: Six County AOG Planning Staff are currently facilitating the organization of community fire councils for the Torrey, Teasdale, Grover area and Mytoge Mountain (northwest of Loa) in order to write fire plans.

Problem Soils

Goal 1 Reduce Risk of Damage due to Problem Soils

Objective 1.1 Reduce risk to new construction from problem soils

Action: Update county/municipal zoning ordinances to avoid new construction in problem soil zones.

Time Frame: Depends on funding.
Funding: TBD
Estimated Cost: $20,000 per jurisdiction
Staff: County/Municipal/Contractual

Background: None

Dam Failure

Goal 1 Reduce Risk of Dam Failure

Objective 1.1 Minimize damage to new and existing buildings due to Dam Failure

Action: Regularly monitor dams and strengthen them when necessary.

Time Frame: Depends on Funding

Funding: TBD

Estimated Cost: Monitoring is minimal to moderate; strengthening dams could be high.

Staff: TBD

Background: The Utah Department of Natural Resources annually inspects all dams within Wayne County and suggests or mandates safety actions when necessary.